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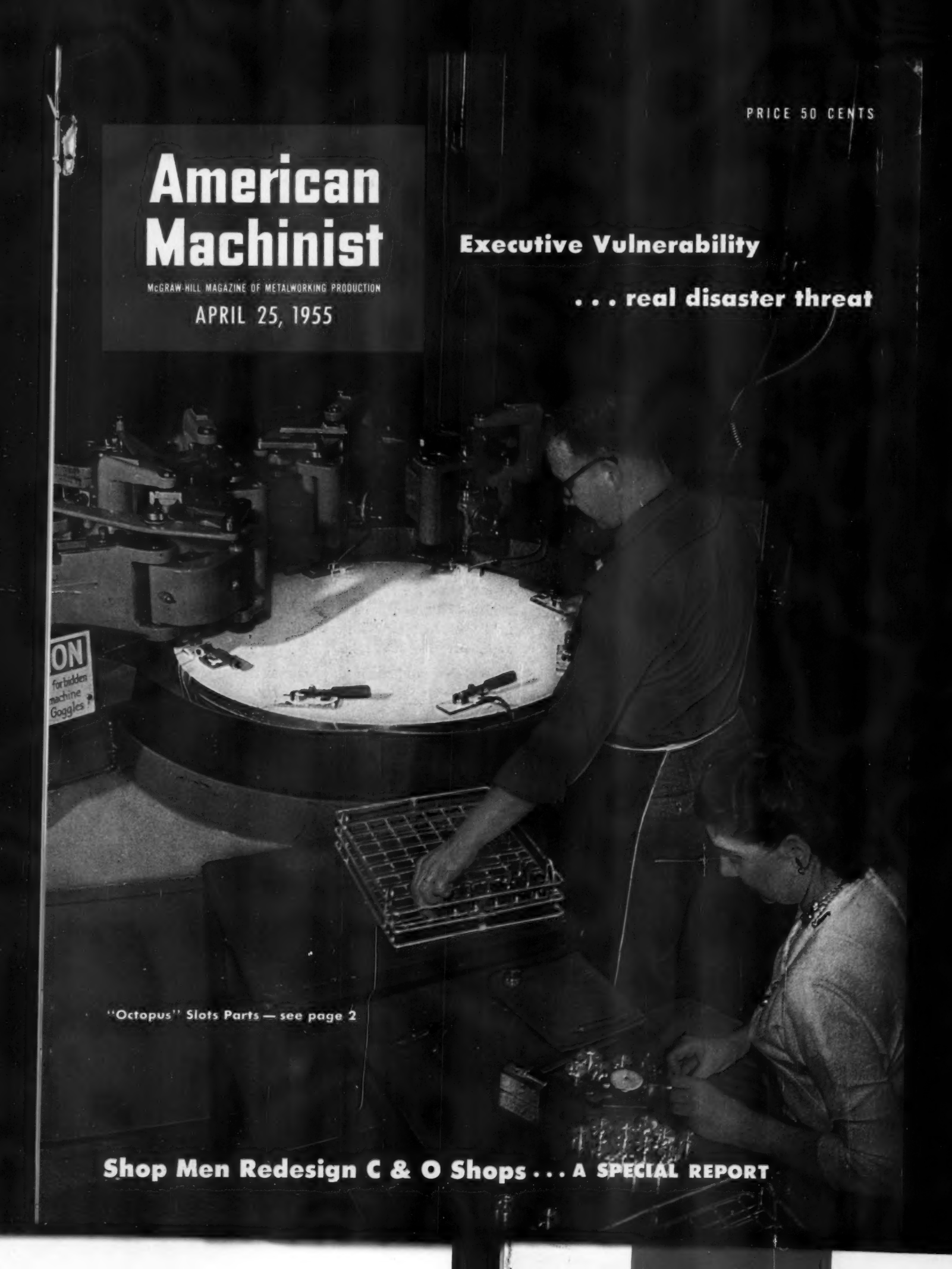
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

APRIL 25, 1955

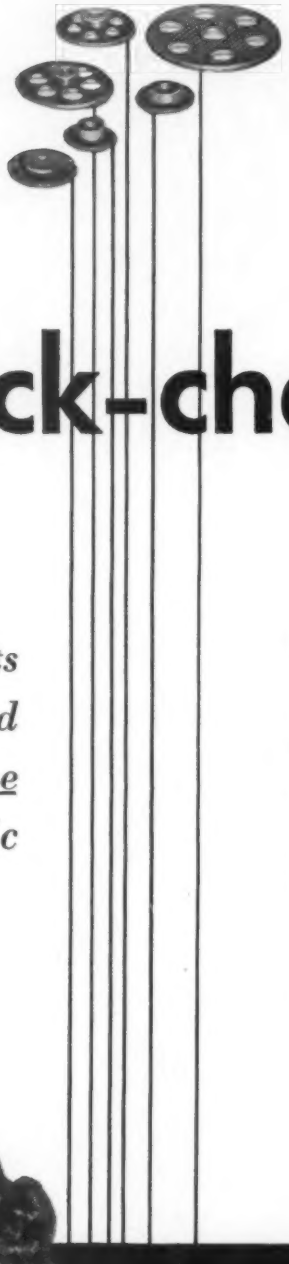
Executive Vulnerability

. . . real disaster threat



"Octopus" Slots Parts — see page 2

Shop Men Redesign C & O Shops . . . A SPECIAL REPORT



quick-change artist

six different parts are easily borized on this one Heald Bore-Matic

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Shown below, for example, is a Model 121 which is used to borize six different gear parts. The basic collet fixture accommodates all six parts and the dial bar tools plus a tool block are readily interchangeable. On five of the parts, the cycle is square and tooling outbores on return stroke to eliminate drag line. The other part utilizes a sweep cycle with cross slide resetting during the rapid traverse out-stroke.

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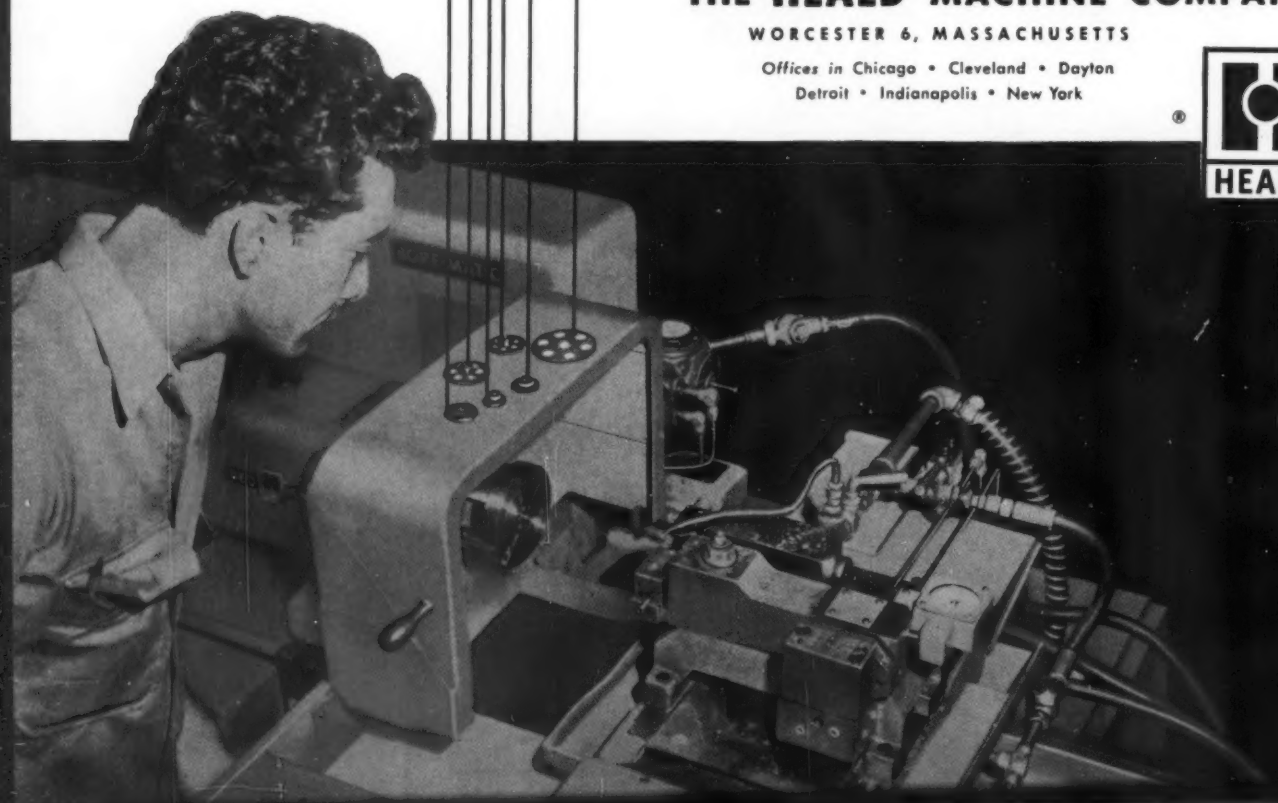

American Machinist

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NUMBER OF COPIES PRINTED THIS ISSUE 37,985

chips

OCTOPUS . . . Easy Washing Machine Co, Syracuse, NY, has a tricky S-curve slot to machine in a fuze part for defense. Tolerances are close (see p 137). One company making these pieces uses profile milling, another contour boring, but Easy found a cost-saving third way—multiple pantographic engraving with the special Gorton machine shown on our cover. It is really four engraving heads mounted over an Avey indexing table, on which are fixtures to carry workpieces. Two heads rough and two finish, on a semi-automatic cycle. Gross potential is 420 pph. An inspector checks parts as fast as produced, warns of burrs or cutter wear that affects finish or tolerances. This and four other smartly solved jobs are described in a Special Report (see biog) just cleared by Army, Navy, and Defense Dept. This cover and all pictures in the Report are by Stan King, Easy staff photographer.

BRAINS ARE VULNERABLE . . . In all the fuss and feathers over potential damage to industry from H-bombs, most people have forgotten that executives are more concentrated than plants. One plant gone is bad enough, but what if the management is obliterated? Then no plants operate. We give you a quick look at what major companies think of this problem in our lead article.

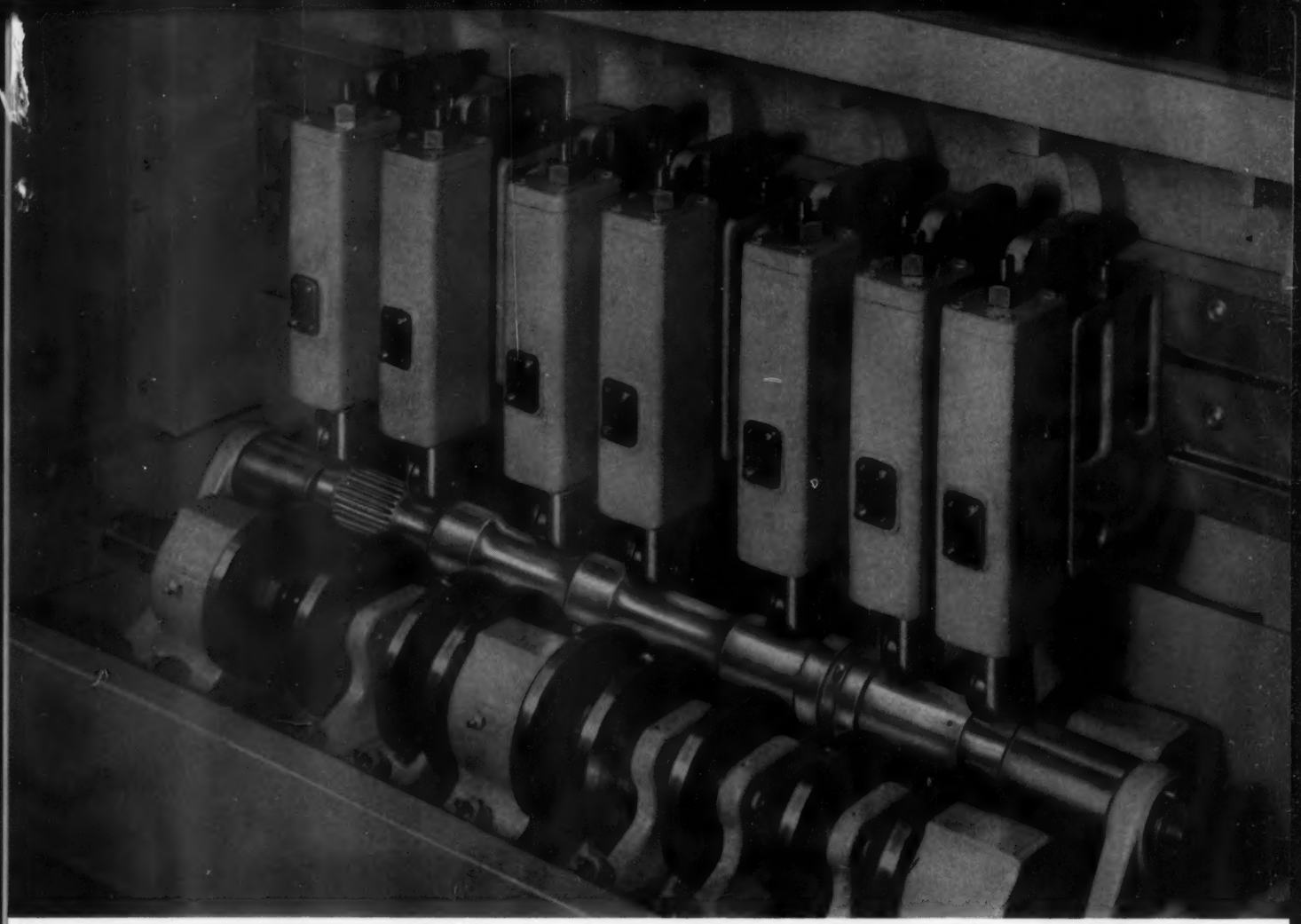
THE SHOP REDESIGNS . . . Methods Simplifiction programs at C&O Shops, Huntington, W Va, had an unexpected result—the various shop groups redesigned their own departments for practice—and the redesigns were so good, they were adopted. These groups included no trained planners—they ranged from apprentice to foreman. The details are in Associate Editor's Stocker's current Special Report. Cost: $1.25 million. Savings: $2 million, plus better results.

DEVELOPING MANAGEMENT . . . Suddenly, several "hot' ideas concerning management deserve to be told. From Jack & Heintz, Cleveland, we have a very new one—a management development program that stimulates enthusiasm, makes supervisors self-starting, and builds a working management team. This is not theory, but practice you'd better study. We thought it valuable enough that we rushed an editor there and rush the story to you here.

TOOLING . . . We have several studies on tooling for you in this issue. First is the use of soft-steel dies to mold short-run plastics, by Wm Girdner, tool engineer of Hewlett-Packard Co, Palo Alto. Simple press setups go along to speed production . . . Next is the use of unit heaters for drying paint, an unusual and successful way to do this job . . . And, lastly, a spread of Shop Shots from selected plants.

COMING . . . May 9 *AM* will include a Special Report on a toolroom that works for surgeons, plus articles on grindability of tool steels, on power spinning, on making internal gears to tenths, on tooling to produce automatic-steering parts, on plant overhaul and on barrel finishing.

SCREW-MACHINE SPECIALIST . . . Frank L Ungleich became associated wtih Easy Washing Machine Corp, Syracuse, NY, on Feb 9, 1942. His first job was as a setup man on automatic screw machines. Four months later, he was made foreman of the Automatic Screw Machine Dept. In 1951, he became a tool engineer on defense work involving use of automatic screw machines and chuckers. His education includes technical courses at Smith Technical High School, Syracuse; Syracuse University; Rochester Institute of Technology; and Brown & Sharpe, Providence. Mr Ungleich has previously been associated with L C Smith & Corona Typewriter for five years, the Kilian Mfg Corp for one year and C C Bradley & Sons, toolmakers, for a year. He is a member of the ASTE, and is the author of three articles which appeared in "Screw Machine Engineering". He authors our current Special Report.



How to eliminate *your* shaft distortion problems

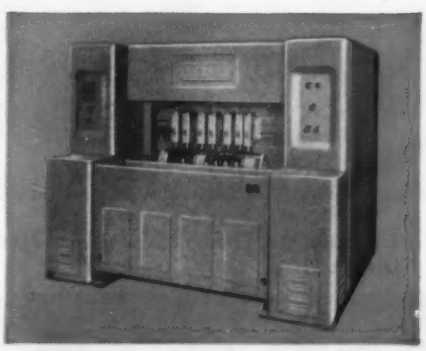
Distortion during hardening is a major production problem.

The Gleason No. 140 Rolling Quench Machine corrects this difficulty, because the quenching and straightening operations are performed at the same time. Because cold straightening is eliminated, valuable production time and expense are saved, and the quenched parts have less residual stress.

Shafts cannot distort because they are rolled under pressure throughout the quenching operation. The operator puts the hot part on the lower rollers and starts the machine. From there on, the quenching operation is automatic. Rolling speed, pressure, and oil flow are pre-set to suit the work that is being quenched.

The automatic quenching cycle saves operator time, and gives *uniform* results for all parts quenched. The pre-set metallurgically correct oil flow gives uniform hardness.

The Gleason No. 140 Rolling Quench Machine is equally suited for small or large quantities. It accommodates shafts $\frac{9}{16}$″ to 4″ in diameter, 6″ to 40″ in length, with integral cams or shoulders up to 8″ diameter. Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling. Write for further information.



The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

GLEASON WORKS

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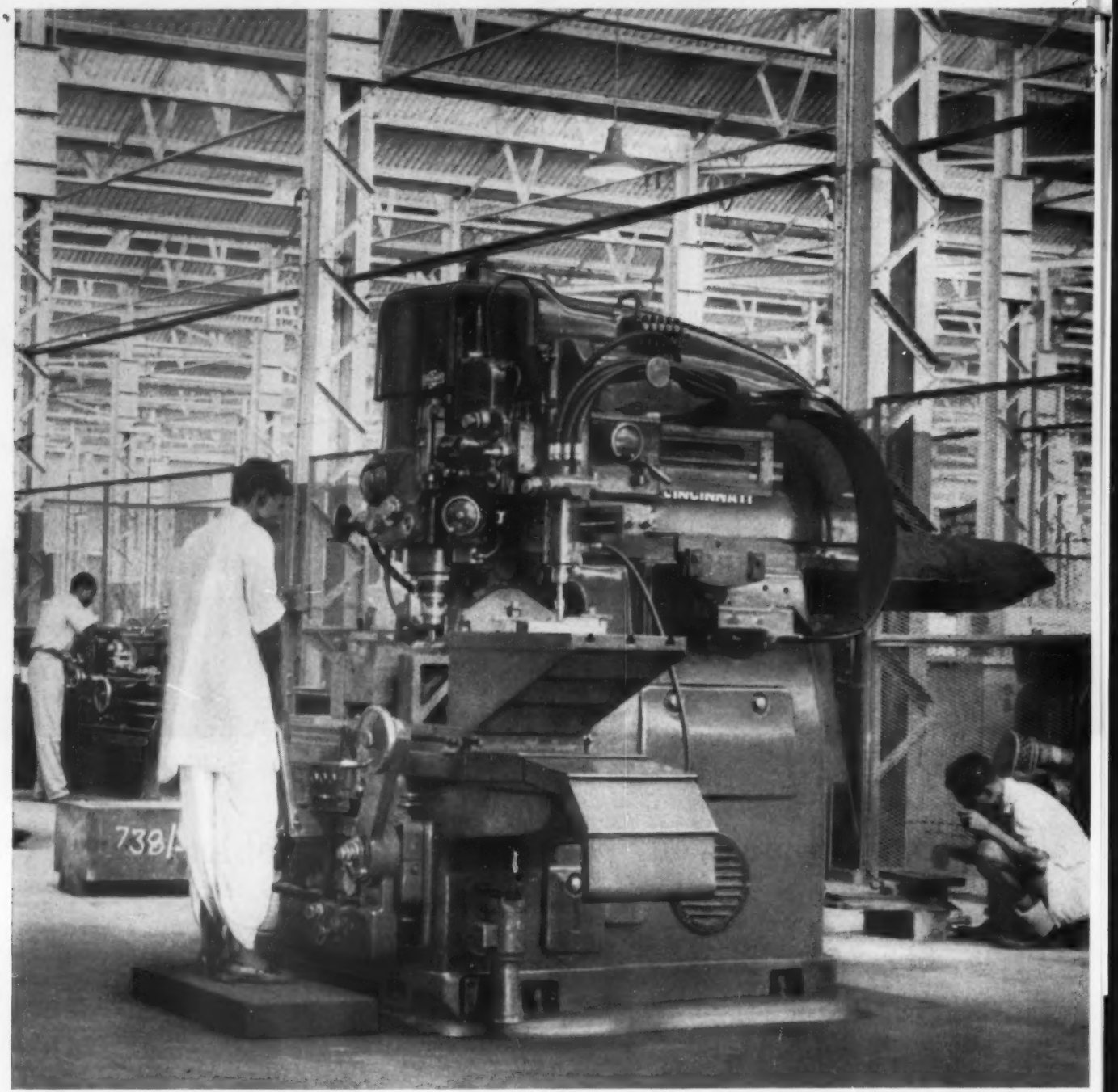
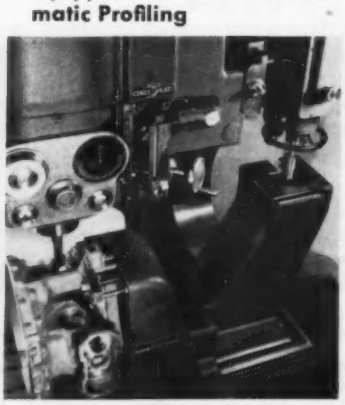
52



Equipped with automatic depth control for **Die Sinking**

Equipped for **360° Automatic Profiling**



Equipped for **Combination Die Sinking and 360° Automatic Profiling**

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Cincinnati Hydro-Tel Milling Machines are Preferred . . .

Reliability looms large in machine tools. It's an especially valuable asset when machines are installed thousands of miles away from home base. Government officials of one country halfway around the world had reliability in mind when they selected the CINCINNATI 16" Vertical Hydro-Tel Milling Machine, illustrated on the opposite page, for one of their railway shops. Other Hydro-Tel advantages of value in shops next door or in India, include a high degree of versatility . . . smooth accurate cutting . . . easy, comfortable operation . . . low maintenance costs . . . automatic, faithful duplication of die impressions (when equipped for this type of work). ¶ CINCINNATI 16" Vertical Hydro-Tel Milling Machines offer top value for shops of all sizes concerned with low-cost milling operations within 5 hp cutting capacity and 30" x 16" x 10" traverse movements. May we give you more information? Complete data in catalog No. M-1497-1, and brief specifications in Sweet's Machine Tool catalog.

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CINCINNATI 9, OHIO

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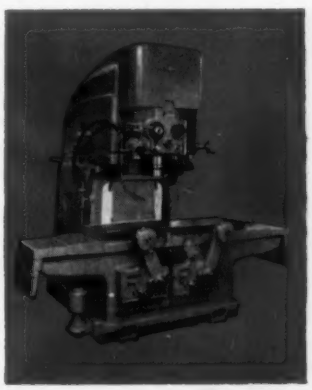
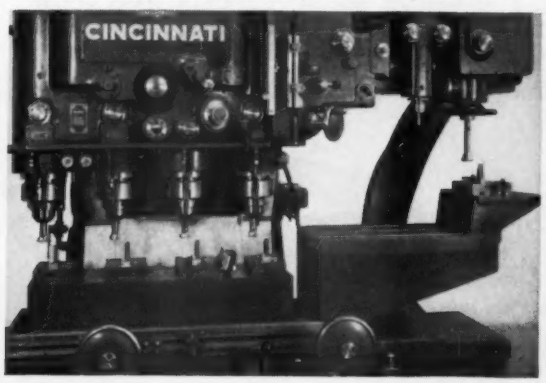


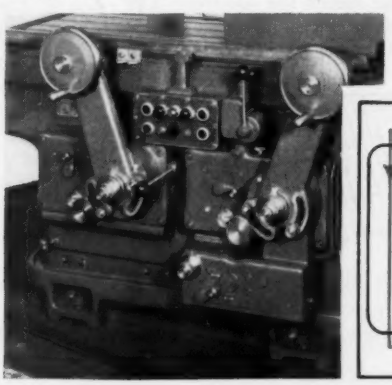
CINCINNATI 16" VERTICAL HYDRO-TEL

This illustration shows basic machine for toolroom vertical milling operations. Catalog No. M-1497-1.

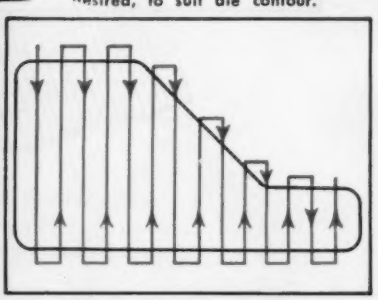
Equipped with **Multiple Spindle Heads** . . . a desirable Hydro-Tel feature for extra production



Equipped with **Automatic Feed Cycle,** including pick feed to table . . . a desirable feature for automatic die sinking



Automatic Feed Cycle Diagram. "Short stroke" button enables operator to reverse cutting stroke, if desired, to suit die contour.



5 ways

FELLOWS GEAR INSPECTION INSTRUMENTS PAY FOR THEMSELVES

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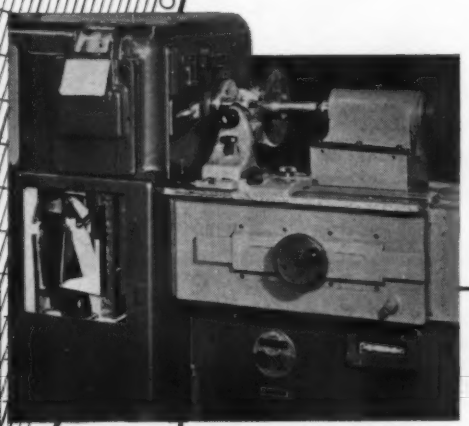
RED LINERS

Automatically record all gear errors in combination on a chart, from which the nature and extent of each kind of error discloses itself. 3 capacities to 18 inches p.d.



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LEAD MEASURING INSTRUMENTS

Also check crown and taper. Two capacities: 12″ and 24″ p.d. Chart errors at 500 to 1 magnification. No involved calculations in setting for various helix angles.

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3. *Less Production Time Lost*

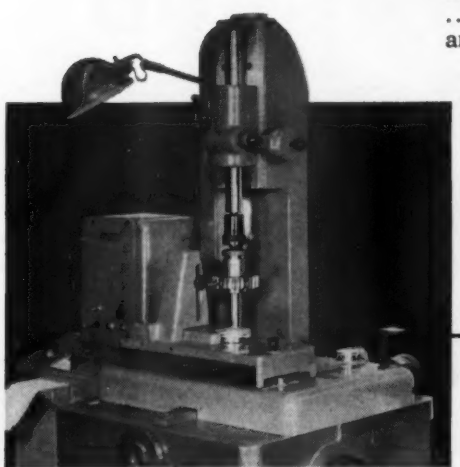
Fellows Gear Inspection identifies the nature of gear errors and permits fast correction... before expensive hours of machine time and labor are wasted.

4. *"Fool-Proof" Assembly*

Fellows Gear Inspection gives proof-positive that specified gear limits have been met before costly man-hours have been invested in assembly.

5. *Improved Customers' Good Will*

If you are making gears for your own use... Fellows Inspection Instruments assure superior gear performance throughout the service life of your product. If you are making gears for another manufacturer ... Fellows Instruments give you CHART RECORDED PROOF beyond argument of the delivery of specified precision.



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"Auto-Cycle" infeed attachment (illustrated) provides completely automatic cycle for plunge grinding (optional).

Work size 4" Diam. x 18" Long. Grinding Wheel 14" O.D. x 2" Wide. 3 H.P. Wheel Motor Optional.

This ultra-modern 418 cylindrical grinder cuts costs of small part grinding. It is especially adaptable for use in tool rooms, job shops, or plants where work is in small, medium or production runs. Jobs are quickly set-up . . . work pieces are easily loaded, ground and unloaded. Every feature in the 418 cylindrical grinder *spells accuracy, speed* and *economy.* Get the full facts today. Write for information.

Cylindrical Grinder

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

A Demonstration of the LANDIS Thread Rolling Machine on your workpieces

THE WORLD'S LARGEST

The new LAN-HY-ROL Thread Rolling Machine offers a combination of precision, productivity, and flexibility in generating external threads unequalled by any other machine now available in the Western Hemisphere. Yet we believe that its superiority is so great that its unlimited potentialities cannot be understood without seeing actual operation.

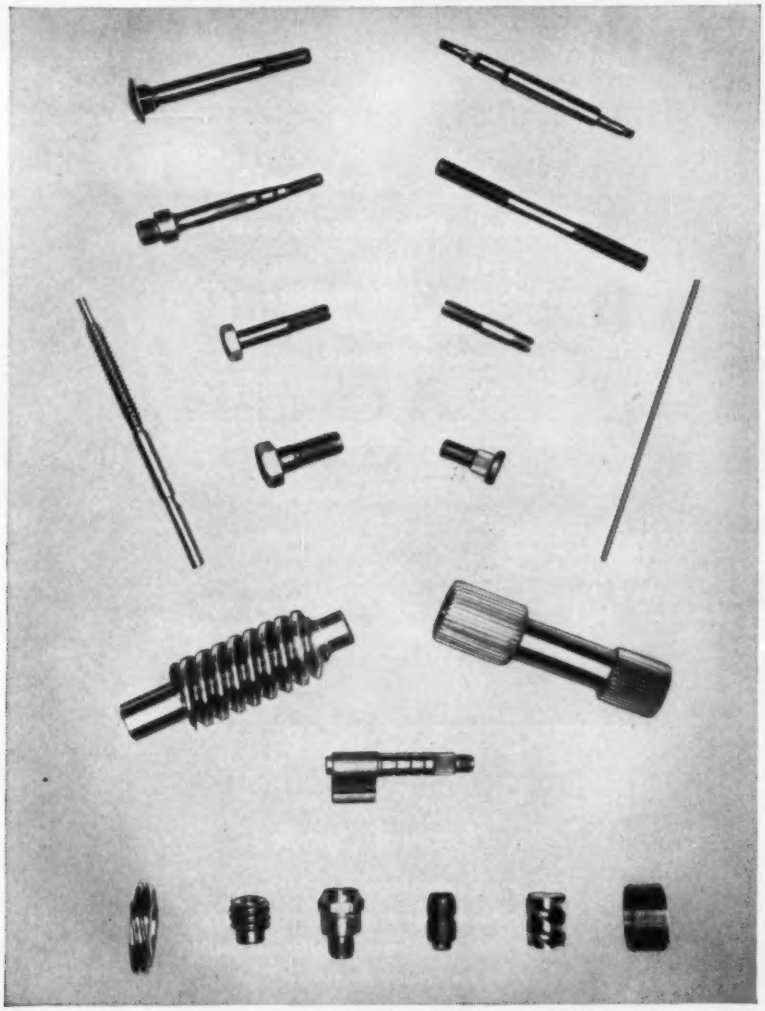
Therefore, we are offering all manufacturers an operating demonstration of the new LAN-HY-ROL, using your own workpieces if you prefer. Send us the necessary thread specifications and prepared workblanks—we will make the dies required at our own expense, then arrange an operating demonstration here in Waynesboro at your convenience.

408-2C

The new LAN-HY-ROL is based on a rolling system using two circular thread rolling dies and a work support blade. It will produce UNC and UNF threads to tolerances up to and including Class 4, and will also roll Acme, worm, and other special threads. The LAN-HY-ROL will roll threads from 3/16″ to 3″ in diameter up to 5-7/8″ long by plunge rolling, and up to 72″ by thrufeed rolling. It can also be equipped for automatic hopper feeding, semi-automatic hand feeding, or rolling special threads between centers.

Plan today to investigate the cost-saving advantages of the new LAN-HY-ROL Thread Rolling Machine. Contact us direct in Waynesboro, or through one of our field representatives, about arranging a demonstration.

MANUFACTURER OF THREADING EQUIPMENT—CUTTING—TAPPING—GRINDING—ROLLING



LANDIS *Machine* CO. WAYNESBORO PENNSYLVANIA

Only Landis grinders have "rigidized" bearings and spindles

for
- maximum production
- fine finishes
- high precision

"Rigidized" Microsphere Bearings

One piece bearings have extremely close clearance between spindle and bearings. Gives accurate work and quick, positive sparkout.

"Rigidized" Spindle

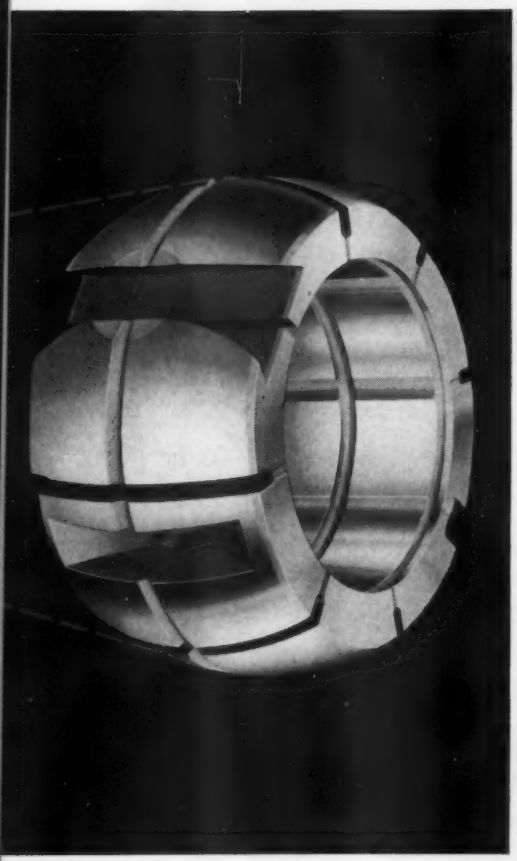
Because the diameter of the spindle between bearings is increased, you can take heavy cuts without loss of accuracy or finish.

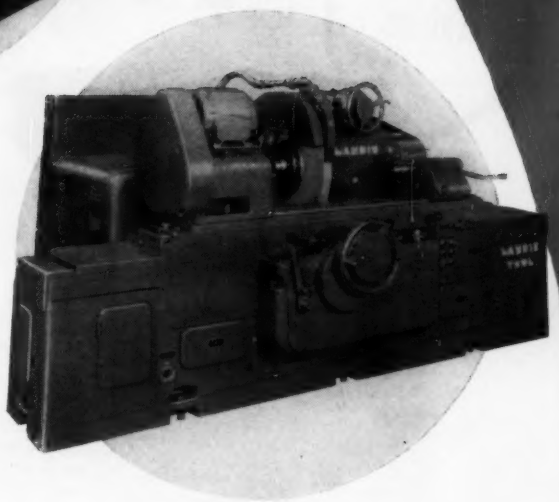
LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Landis Universal Grinders have rigidized Microsphere bearings and spindle.

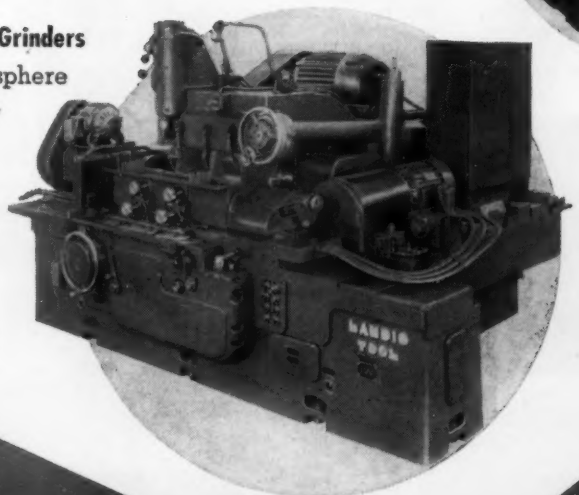




Landis Plain Grinders have rigidized Microsphere bearings and spindle.

Landis Centerless Grinders have rigidized Microsphere bearings and spindle in both the grinding wheel and regulating wheel heads.

Landis Single-Purpose Grinders have rigidized Microsphere bearings and spindle.

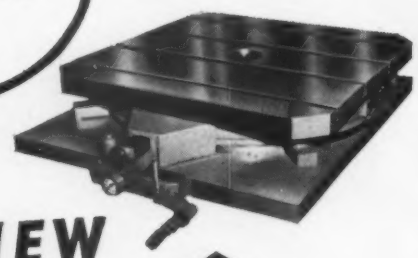


Fast-Working

G & L machine tool attachments and accessories

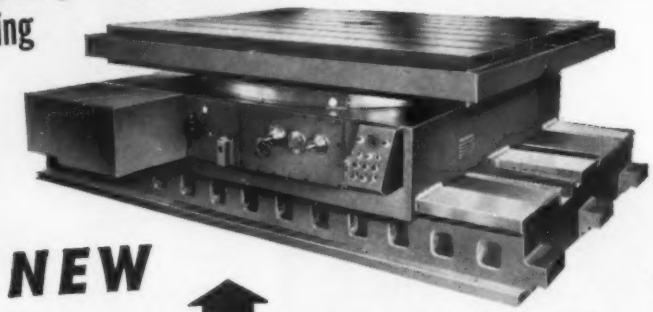
Rotary Tables

reduce number of work settings... provide rapid and accurate indexing



NEW

NEW Giddings & Lewis Air-Lift rotary table eliminates multiple setups and is capable of 90° indexing off center loads. By turning a valve, air is forced into the unit, raising the table .001". With air acting as bearing, table "floats on air"... can be indexed to desired position... and firmly settles on non-lubricated seat. There's no oil film to disturb the accurate setting. Tables are available with round or square platens, both in 36" and 48" sizes.



NEW

The NEW 8-ft. power-driven, precision rotary table is built to support 50 tons. Ample powered motors provide feed and rapid traverse, and unlimited travel on 8-ft. runway width. It's equipped with a precision indexing device, graduated in .001".

Adaptability of this powered table enables the machine to do more jobs . . . eliminate numerous setups and the necessity for several special machines.

Giddings & Lewis plain or hand and combination power feed tables provide fast, accurate indexing and make it possible to machine a number of surfaces in a single setup. They're available in round, square and rectangular platens in various sizes.

Hand feed rotary tables — 24" and 30".

Plain rotary tables — 24", 30", 36" and 48" (round); 30", 36" and 48" (square).

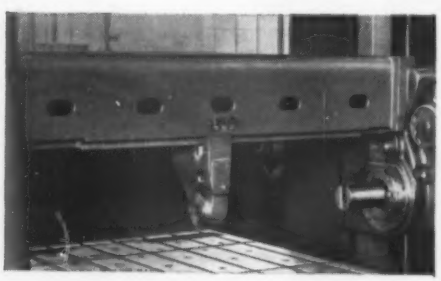
Combination plain, hand and power feed rotary tables — 36", 48" and 60" (round or square) and from 36" to 60" x 96" with intermediate sizes for rectangular platens.

Angular Milling Attachments

perform many different milling operations at various angles in a single setup

ARBOR SUPPORT (cross rail)

This accessory unit with different length cross rails, which move up and down with the headstock and end support block, meets the requirements of various table widths. It's possible to set milling cutter at any position over the table. Thus with single or multiple supporting arms on the cross rail, it's easy to perform slab, gang and straddle milling operations. Arbors up to 3" diameter can be used.



MODEL A (single spindle)

This 90° angular milling attachment offers unusual flexibility for machining hard-to-reach surfaces. Head swivels 360° in a plane at right angles to the machine spindle. Head flange is graduated in ½ degrees. Adaptors of different lengths permit placing of cutting tool from 24" to 42" from headstock.

Other angular milling attachments, not illustrated here, include light, medium and heavy duty (single and two-spindle types) and special models.

MODEL D (sliding head)

This right angle, sliding head, heavy duty head with a variable reach is practical for heavy milling, boring, drilling, reaming, etc. Provided with an adjustable overarm support, the head swivels 180° and may be extended up to 19".

Model F, medium duty, angular attachment is also available for machining operations at any angle in large openings and cavities. According to machine size, milling head may be extended 48", 60" or 72", and operates at same speed as machine spindle. Feed is obtained by spindle traverse.

Profit-Makers!

increase production...lower machining costs

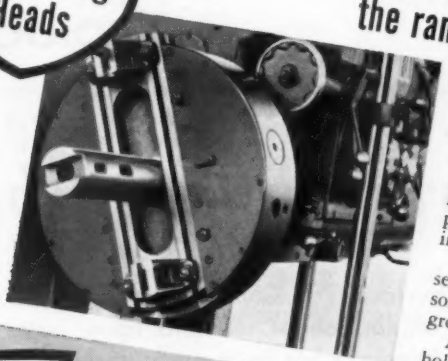
You get more production at lower cost and realize greater profits with Giddings & Lewis Horizontal Boring, Drilling and Milling machines when they're equipped with complete auxiliary attachments. It's common knowledge that no other machine can equal the wide variety of standard and unusual operations which a G&L machine can perform. Because it's so versatile, the operator can complete the job faster . . . considerably reduce floor-to-floor time . . . practically eliminate costly resetting and relocating of the workpiece.

Illustrated here are only a few of the attachments offered by G&L. If you're searching for an all-purpose machine plus a combination of profit-making attachments, call our nearest Giddings & Lewis representative. He'll give you all the details.

Write for Literature: Continuous Feed Facing and Boring Heads — A-10; Rotary Tables — A-20; Angular Milling Attachments — A-30; Set-Up Accessories — A-40.

Continuous Feed Facing and Boring Heads

efficiently handle a wide variety of operations well beyond the range of the machine spindle



This attachment is available for G&L Horizontal Boring, Drilling and Milling machines in 300, 30, 50 and 70 Series. Mounted on the machine headstock or on a line boring bar, it efficiently handles a variety of operations on circular flat surfaces, and external and internal cylindrical surfaces. It imparts a rotary motion with continuous feed. The tool slide is provided with six power feeds in both directions, independent of the spindle feed. A micrometer dial registers feed in increments of 0.001".

The Continuous Feed Facing and Boring head can be used separately or in combination with other attachments and accessories for turning, facing, counterboring, recessing, threading, grooving, forming, back facing, etc.

Also available are telescopic, right angle and facing tool holders, and a high speed grinder.

Improved Measuring Device

Improved Measuring Device is for work where readings to 0.0001" are required as compared with readings to 0.001" permitted by the standard machine scales and verniers. For use with G&L Table Type machines only, the device allows for extremely precise measuring of vertical travel of the headstock and cross travel of machine table on the saddle. A similar device for measuring saddle movement can also be supplied. Precision end rods for use with the device are available in complete sets or as individual units.

Box-type angle plates and parallels

Parallel block — Box-type parallel — Box-type angle plate

Parallel blocks and box-type parallels are precision machined for both squareness and parallelism. They're available in a broad range of sizes — solid block of alloy steel; ribbed, close-grained cast iron, and full box-type with T-slots on top and sides.

Box-type angle plates, made of one-piece castings, are available for precision milling or boring vertical surfaces of workpieces, either at right angles or parallel to the machine spindle. T-slots and locating keyways are planed to close tolerances.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

Announcing VK MICROGAGES

.000008" ACCURACY

81-BLOCK SET
$250.00

30% *more wear surface than rectangular blocks*

Two really new and important facts should be noted in this announcement by Van Keuren: the closer tolerance of ±.000008" on VK Microgages, and the 81-block combination of ⅞" diameter longer-wear gages . . . now available for the first time.

These fine quality precision gage blocks by Van Keuren are products of the same machine-lapping and inspection techniques as Van Keuren Rectangular and Solid Square gage blocks. Size tolerance as already noted is guaranteed, as well as a maximum surface roughness of 1 RMS. Because their round shape provides greater wear surface, Van Keuren Microgages can be depended on for longer life and lower cost. Their closer tolerance has been particularly developed to meet today's demands for more exacting precision in shop work.

In addition to the new 81-block closer tolerance set featured here, Van Keuren offers 15 other standard sets of Microgages; also Solid Square type sets of gage blocks in .000004" accuracy and Rectangular type sets in .000004" and .000008" accuracy. For further information address: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

"Quality in Millionths"

VK
36th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

No. 4 in a series

CONE WITH UP STEP

You get demonstration of your work and complete job development record

Cone submits samples of your work

Cone makes recommendations

You send print to Cone

No "automatic" user can afford to be out of touch with the latest developments in the use of carbide tools.

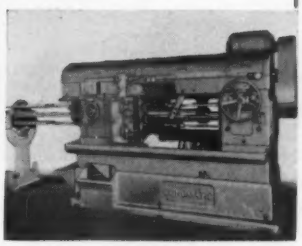
The popularity of the Conomatic Carbide Development program has made necessary larger quarters for increased clientele accommodation.

This innovational Cone service is without obligation of machine purchase and is available to users of any brand of multiple spindle automatic.

It costs nothing to know just how profitable your work might be with modern machines, tools, and know-how.

DATA FOR COMPARISON

Part.....Spec. Cap Screw	Length.....$4\frac{17}{32}$" Cutoff 2" Thread
Machine.....1⅝" Conomatic	
Tools.....100% Carbide Tipped	RPM.....885 Work Spdl. 580 Th'd Spdl. 1465 Total Eff'd.
Material.....8742	
Stock Size.....1" Across Flats	Time.....14 Secs.



Conomatic

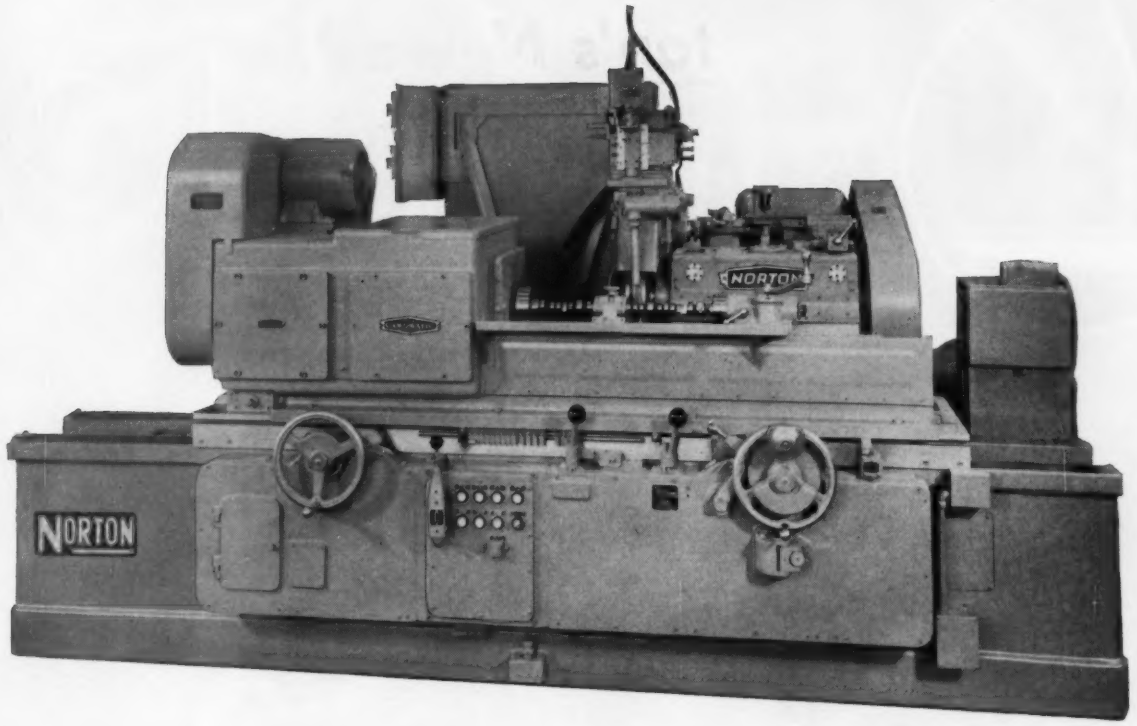
Send for particulars on "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

Norton's Newest!

The No. 3 CAM-O-MATIC grinds camshafts better...

BUILT-IN OPERATING SKILL of the No. 3 CAM-O-MATIC Grinder is a typical Norton "Touch of Gold" that adds value and boosts profits. Many automatic features on this greatly improved machine reduce the operator's duties to loading and unloading. He can easily tend two or more machines — while *you* get better grinding for less money.



Highly advanced automatic grinder sets new standards for production, precision and finish

With the No. 3 CAM-O-MATIC Grinder, Norton introduces a new concept of efficiency in camshaft grinding.

No other machine of its type offers you such a combination of exclusive features, rugged construction and simplified operation. No other machine can do more towards stepping up the quality of your camshaft production, while cutting grinding time and costs.

Greater Rigidity Improves Performance

The No. 3 CAM-O-MATIC Grinder features solid, rigid construction that means minimum vibration, more accurate performance and longer service life. Another big advantage for fluid, shockless operation is that the entire operating cycle is geared to split-second efficiency. Indexing is ultra-smooth and extra-rapid. And the wheel-slide retraction after grinding each cam is no greater than maximum stock removal.

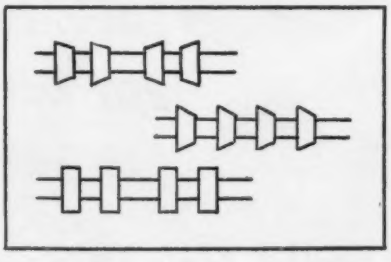
Speed is always right — automatically

The No. 3 CAM-O-MATIC Grinder's automatically compensating work speed arrangement is a valuable aid to faster, more accurate grinding. Starting with the ideal speed for rapid stock removal, it changes to exactly the right speed for fine finishing and contour accuracy — as each cam is being ground. This eliminates guesswork, manual adjustment and lost motion.

Wheel truing is automatic, too

Still another example of built-in operating skill is the wheel truing device, in which the truing diamond is automatically advanced across the wheel face and back, cutting in both directions. This is done while the operator is loading and unloading, so no time is lost. And by removing only just the amount of abrasive required for truing, the working life of every wheel is prolonged.

Your choice of tapers



The swiveling wheel slide — a Norton patent — permits grinding cam tapers in one direction (standard equipment) or tapers in opposite directions on the same shaft (an optional extra). Both arrangements permit straight-face grinding, as well — thus increasing the versatility of your camshaft production equipment.

See your Norton Representative — or write direct — for full details on the No. 3 CAM-O-MATIC Grinder. And remember, only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

***To Economize, Modernize with* NEW**

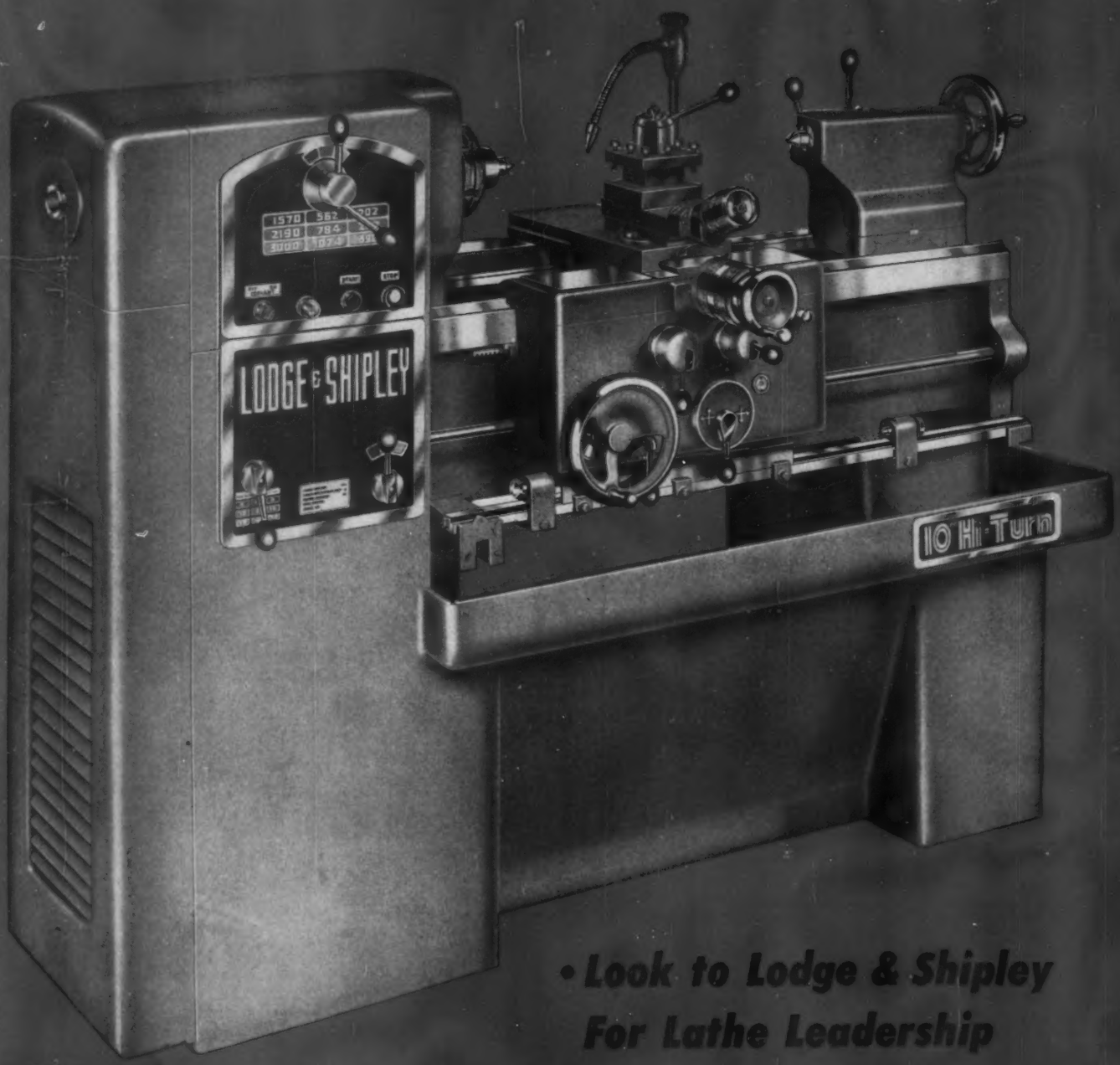
NORTON

GRINDERS *and* LAPPERS

Making better products... to make your products better

District Sales Offices:
Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit — *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5, Ontario

NEW LODGE & SHIPLEY 10"



• Look to Lodge & Shipley For Lathe Leadership

*Above price is FOB CINCINNATI, OHIO and is exclusive of applicable taxes customarily paid by the buyer.

***SEE IT* NOW! and *SEE IT* AT THE MACHINE TOOL SHOW, SEPTEMBER 6-17**

Hi-Turn LATHE

A SMALL LATHE with FAMOUS LODGE & SHIPLEY QUALITY and ACCURACY

FULL 5 H.P.
3000 R.P.M.
HEAVY DUTY
GEARED HEAD

only
$4,985*

including electrical equipment, ammeter, direct reading cross feed dial, dial for apron handwheel, pan, pump and tubing, and other items.

The Lodge & Shipley 10" HI-TURN Lathe is a completely new concept in lathes . . . new in size, design, utility and even in price—offering far more productivity for the dollar. It provides high speed turning, boring and facing capacity for production departments, where the use of a leadscrew is of no consequence.

Over a period of years, Lodge & Shipley research with lathe users of every type, established the fact that lathes used on a production basis rarely require leadscrews. Tailoring the 10" HI-TURN exactly to production requirements, Lodge & Shipley has eliminated the leadscrew and all its complicated gearing. The result is a rugged lathe of high accuracy, efficiency and productive capacity at a price substantially lower than conventional lathes.

Put the money-making 10" HI-TURN to work in your plant now! Like all Lodge & Shipley equipment, it's available on new deferred payment and lease plans. *Write for Bulletin 300, The Lodge & Shipley Co., 3055 Colerain Avenue, Cincinnati 25, Ohio.*

NEVER BEFORE...SO MANY FEATURES... SO MUCH QUALITY AT SUCH LOW COST!

- Nine speeds up to 3000 RPM and 5 HP
- Built-in horsepower ammeter
- Color-coded speed and feed selection
- Totally-enclosed quick change gear box
- Dynamically braked motor in leg
- Template type, multiple length stops, magnetic clutch-operated
- 3 point floor mounting, requires no special foundation . . . easy to level
- Convenient, integral coolant system
- Chip pan effects easy chip removal
- Twist resistant elliptical girth bed
- Flame-hardened and ground replaceable steel bedways
- Hardened and ground cross slide ways
- Anti-friction bearings and trouble-free mechanized lubrication
- Direct reading cross and top slide dials
- 4-way tool block built into top slide
- Provision for rear tool block . . . multiple dovetail tool holders

Lodge & Shipley

your LODGE-*ical choice*

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RAM TYPE TURRET LATHES

NO. 2 ALL-GEARED HEAD
1" Bar Capacity
14" Swing

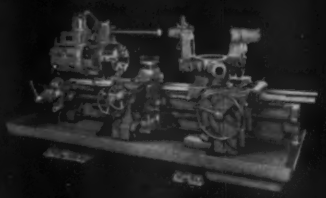
NO. 3 UNIVERSAL
1½" Bar Capacity
15⅜" Swing

NO. 4 UNIVERSAL
2" Bar Capacity
18⅛" Swing

NO. 5 UNIVERSAL
2½" Bar Capacity
20" Swing

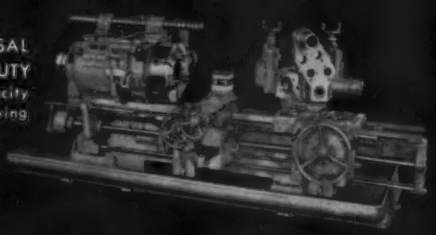
SADDLE TYPE TURRET LATHES

1-A UNIVERSAL
HEAVY DUTY
2⅛" or 3" Bar Capacity
16¼" Swing



2-A UNIVERSAL
HEAVY DUTY
3½" Bar Capacity
20" Swing

3-A UNIVERSAL
HEAVY DUTY
4½" or 6" Bar Capacity
23½" Swing



4-A UNIVERSAL
HEAVY DUTY
8" 9" or 12" Bar Capacity
28¼" Swing

PRECISION TAPPING AND THREADING MACHINES

NO. 10
TAPPING MACHINE
0-80 to 10-24 Capacity

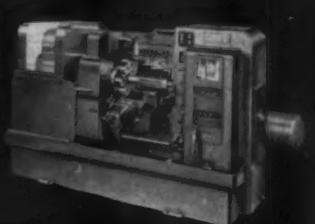
NO. 11
TAPPING MACHINE
8-36 to ⅞" Capacity

NO. 11 RS RADIAL (Single Head)
NO. 11 RD RADIAL (Double Head)
8-36 to ⅞" Capacity

NO. 12
TAPPING MACHINE
⅜" to 2½" Capacity

MULTI-SPINDLE AUTOMATICS

6-SPINDLE BAR MACHINE
¾" or 1¼" Bar Capacity



5-SPINDLE
CHUCKING MACHINE
6" Swing

5-SPINDLE BAR MACHINE
1¼" Standard Bar Capacity
2¼" Oversize Capacity

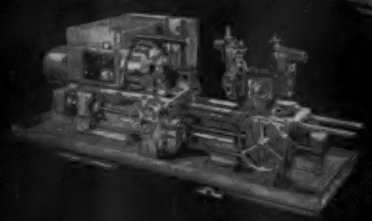
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

© The Lodge & Shipley Co. 1955

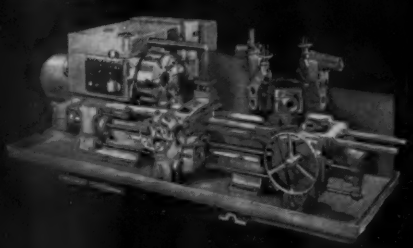
SADDLE TYPE TURRET LATHES

1-A UNIVERSAL
EXTRA-HEAVY DUTY
2½" or 3" Bar Capacity
16¼" Swing

2-A UNIVERSAL
EXTRA-HEAVY DUTY
3½" or 4½" Bar Capacity
20" Swing



3-A UNIVERSAL
EXTRA-HEAVY DUTY
4½" or 6" Bar Capacity
23½" Swing

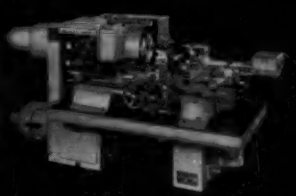


4-A UNIVERSAL
EXTRA-HEAVY DUTY
9" or 12" Bar Capacity
28¼" Swing

ELECTRO-CYCLES

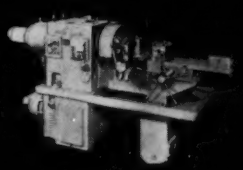
NO. 1 ELECTRO-CYCLE
⅜" Bar Capacity
11" Swing

NO. 2 ELECTRO-CYCLE
1" Bar Capacity
14" Swing

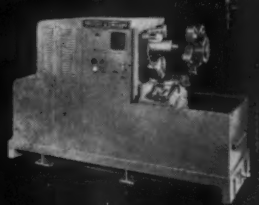


NO. 3 ELECTRO-CYCLE
1½" Bar Capacity
15⅜" Swing

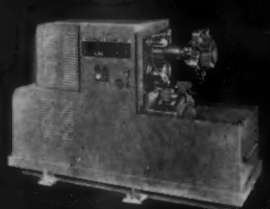
16" ELECTRO-CYCLE
1½" Bar Capacity
16⅞" Swing



SINGLE SPINDLE AUTOMATICS

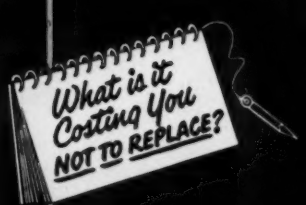


1 AC CHUCKING MACHINE
8" or 10" Chuck — 6" Working Stroke



2 AC CHUCKING MACHINE
10" or 12" Chuck — 9" Working Stroke

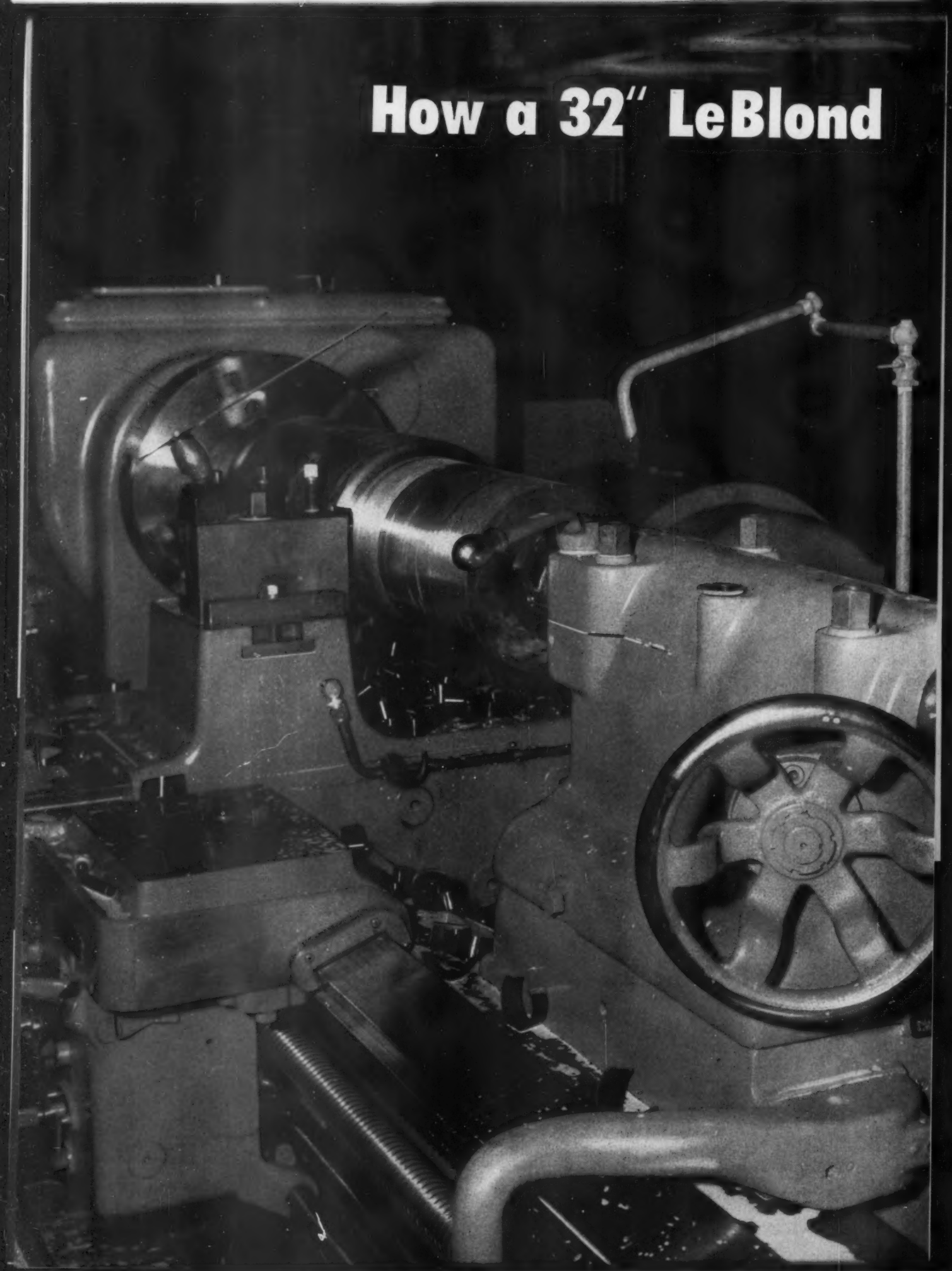
When the going gets tough ...put it on a WARNER & SWASEY



WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

How a 32" LeBlond



GENERAL ELECTRIC ANNOUNCES . . .

takes a measured 118-HP cut

Wanted. *A 32″ lathe to stand up under 100-plus horsepower cuts. Must also provide unusually-wide range of feeds and infinitely-variable speeds.*

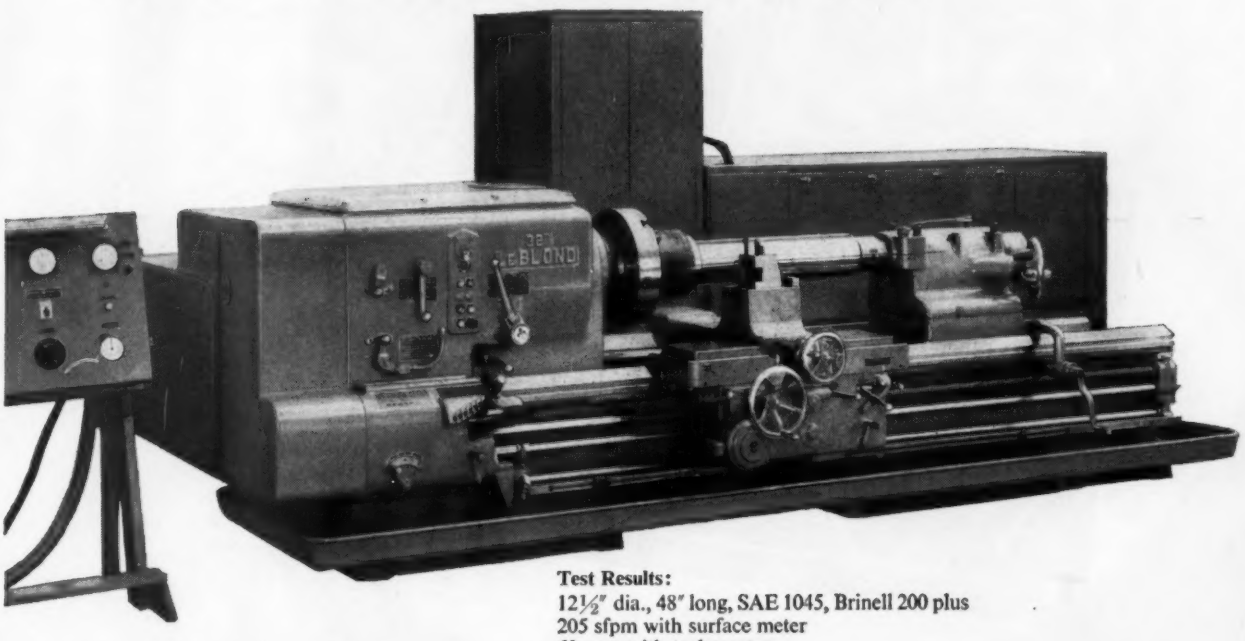
No standard model could fill these requirements. But our new 32″ Heavy Duty had the ruggedness that was needed. We made some changes, mainly in the headstock, and produced a 32″ lathe with these specifications:

Drive; 125 hp, variable speed.

Speeds; infinite from 42 to 1400 rpm.

Feeds; 56 from .002 to .250 ipr.

Plus these features that are standard on our 25″ and 32″ lathes: 4-directional power rapid traverse built into apron; one-piece double-wall apron, hardened rack; totally-enclosed quick-change box; hardened and ground replaceable steel bed ways; thrust-lock tailstock.



Test Results:
12½″ dia., 48″ long, SAE 1045, Brinell 200 plus
205 sfpm with surface meter
63 rpm with tachometer
.083″ feed per rev.
1″ depth of cut
2 hp reading on meter before cut
120 hp reading on meter during cut
118 net hp at the cut

This lathe, with variations to suit your needs, is now available. It appears to be well-suited to very high production turning of large forged or cast-steel shafts and rolls. For quotations against your specifications, get in touch with the nearest LeBlond Distributor or write Cincinnati direct.

. . . . cut with confidence

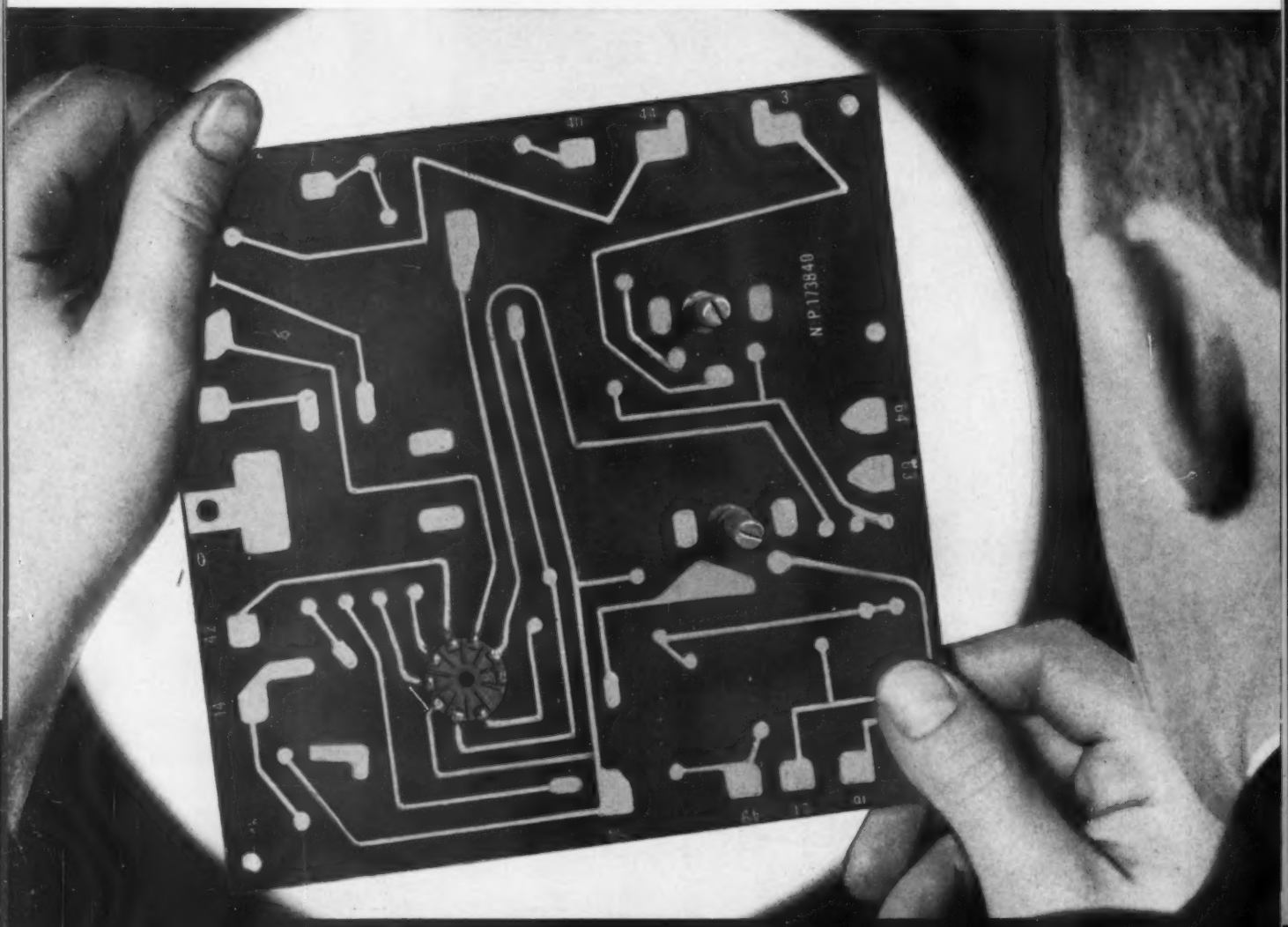
LeBLOND *of Cincinnati*

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 67 YEARS.*

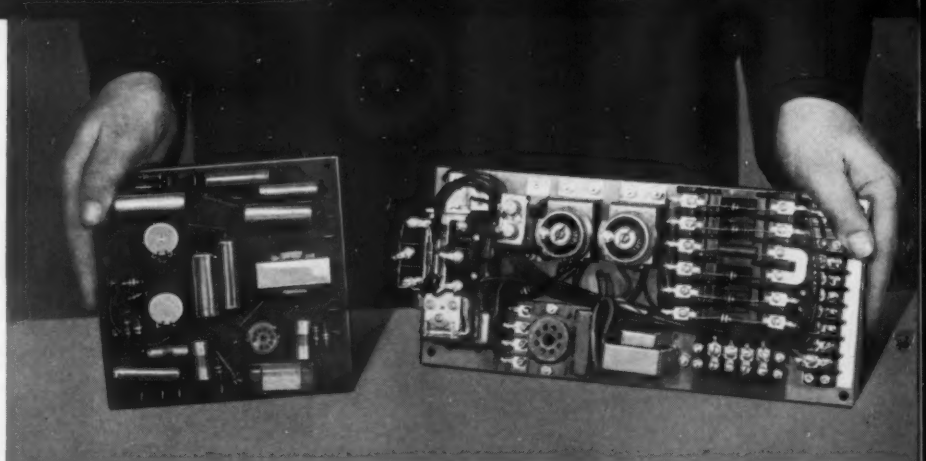
GENERAL ELECTRIC ANNOUNCES . . .

NEW, Low-price Thy-mo-trol*



Printed Circuits—or "wireless" circuitry—constitute the "brains" of the new general purpose Thy-mo-trol Drives. Simply, it is a method of printing an electrical diagram on the back of a sturdy, lightweight plastic board. The electrical "track" or diagram is made of solder-covered copper strips.

All circuit components within the "brain" are connected without the use of wiring! A protective coating is sprayed over the entire printed circuit. All connections to the control circuits are of the simple "plug-in" type, making attachment and removal of connecting circuits a simple, hand operation.



"Brain" of new Thy-mo-trol Drive—printed control circuits. Top photo shows printed electrical diagram. G.E.'s industrial adaptation of this process helps reduce size and complexity of circuits. In lower photo, new at left, conventional at right.

Drive with Printed Control Circuits

NOW! GET RELIABLE, SMOOTH, ADJUSTABLE SPEED FOR MACHINE TOOLS IN A SIMPLIFIED, LOW-PRICED DESIGN

Designed for quality performance, reliable operation, easy maintenance, and at a new low price, a new and simplified line of general purpose Thy-mo-trol Drives has been developed by General Electric. These drives represent a new and far-reaching step in electronic adjustable speed.

An approximate 20% price reduction under the line it replaces is possible because G-E has successfully simplified the entire control system and has adapted printed control circuits into the Thy-mo-trol panels. New Thy-mo-trol design allows a substantial reduction in *weight, size, circuit complexity, wiring, maintenance costs and installation cost.* The new design is now available in two ratings: ¾ to 1 hp and 1½ to 3 hp—making your choice of an adjustable speed drive to meet specific needs that much easier.

Operating directly from a-c power, the new standard Thy-mo-trol Drive includes an electronic control panel, a d-c motor, and a push-button station. No anode transformer is necessary if operated on 440 volts, 50 or 60 cycle, single phase power. Separately mounted auto-transformers are supplied as a standard feature for voltages other than 440.

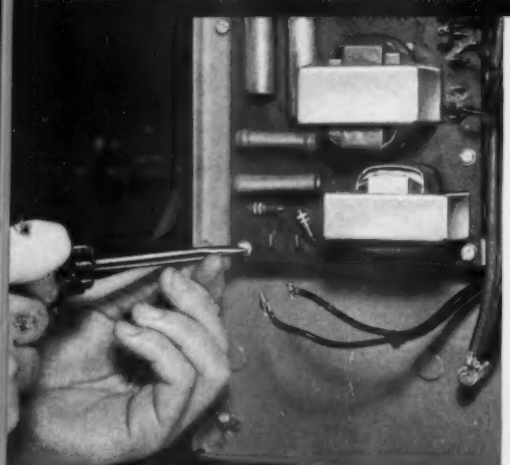
The new drive is rated at constant torque over the entire speed range. Speed range is 8 to 1 for continuous duty with higher ranges possible for special applications. Optional modifications include jogging, reversing, tachometer feedback, reactor loop control, and external current limit adjustment.

For more information on this outstanding new adjustable speed drive, contact your nearest G-E Apparatus Sales Office or write for Bulletin GEA-6234, General Electric Company, Section 791-1, Schenectady 5, New York.

Progress Is Our Most Important Product

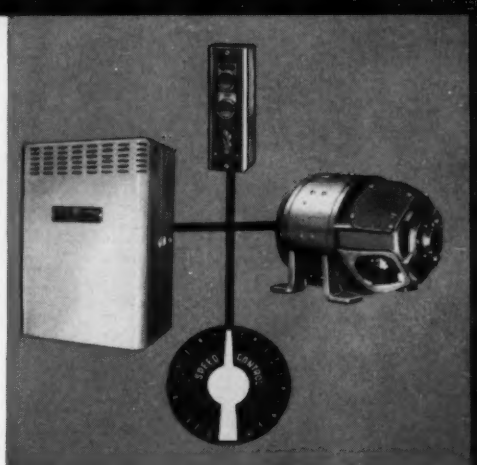
GENERAL ELECTRIC

*Registered Trade-mark of General Electric Company



Easily attached or removed. Only a screwdriver is needed. Plugs and terminals are numbered for easier service.

Simplified repair. Component replacement is fast and easy—a simple bench operation. No need to discard entire unit.



Three basic units. DC motor, pushbutton station, and panel containing tubes and "brain" make up new Thy-mo-trol Drive.

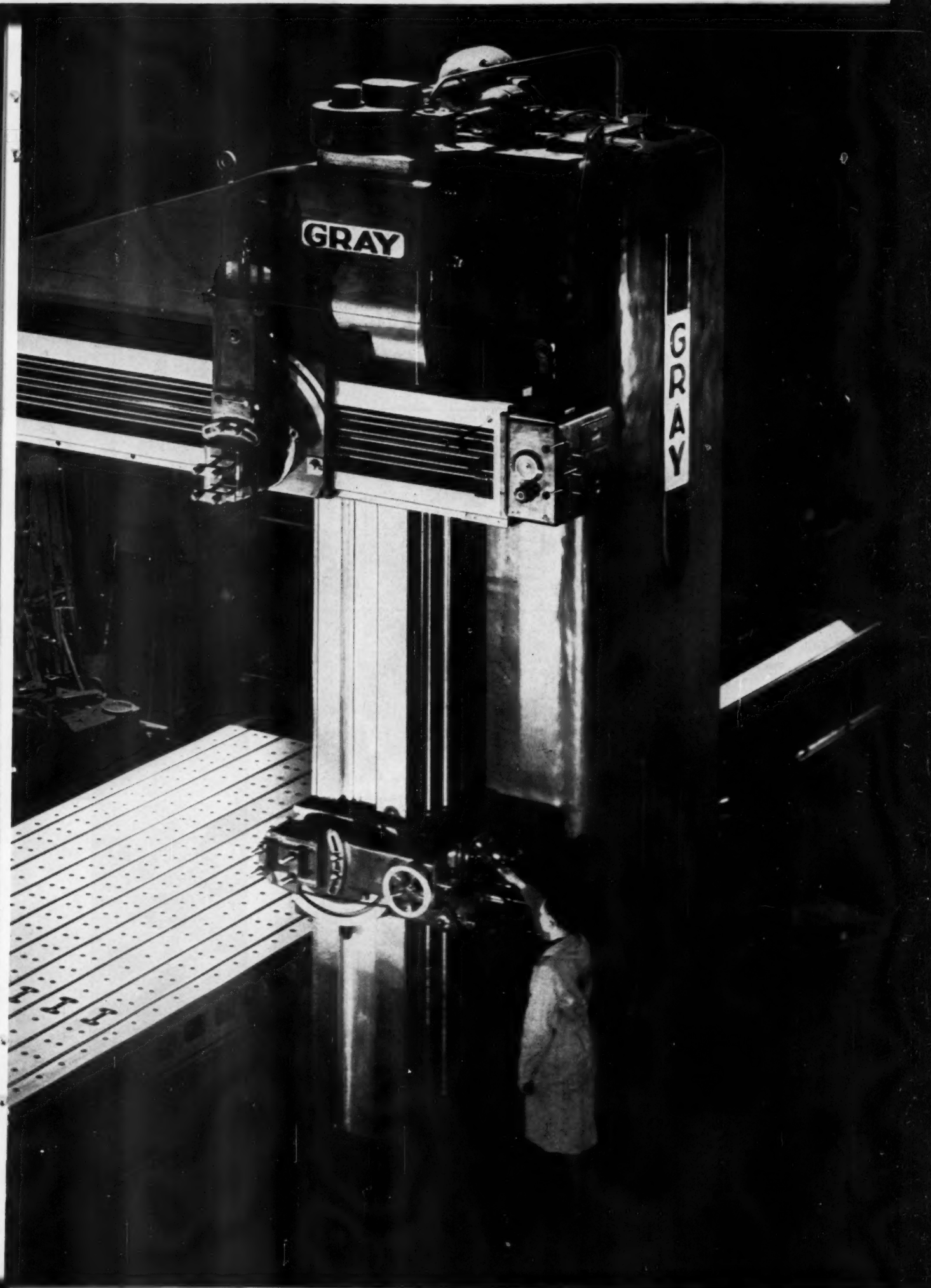
King - size

Here is one of the year's largest planers, a GRAY, immense in size, yet so superbly engineered and magnificently built that its precision performance is a marvel to behold.

All GRAY planers from king-size Giants to eager Cubs are built for high production. They have more original engineering developments and production features than any other planer. They are in such demand that GRAY is the largest planer builder, further proof that

Quality doesn't cost . . . it pays.

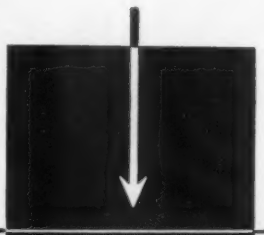
The G. A. GRAY Co., Cincinnati, Ohio.

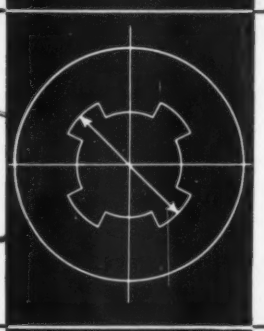

GRAY
GRAY

NUMBER THREE IN A SERIES

What's The Best Way To Gage These Parts?

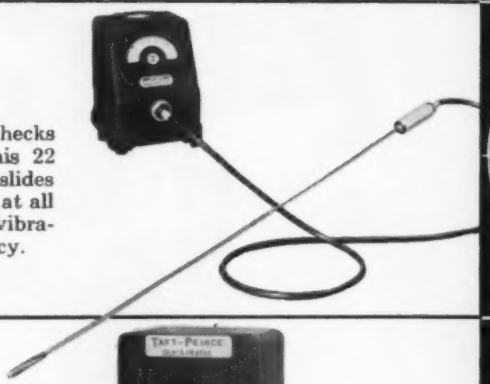
Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage

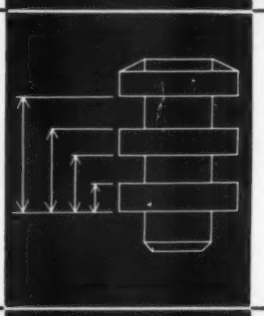




Helical Groove Diameter
Tolerance: .002″

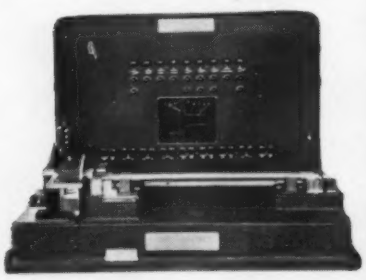
A single dial T-P CompAIRator Air Gage checks the helical rifling groove diameters in this 22 caliber rifle bore 32″ long. Gaging member slides in and out of bore, checks groove diameter at all points. Extremely sensitive yet sturdy — vibration, jarring, tilting won't disturb its accuracy.

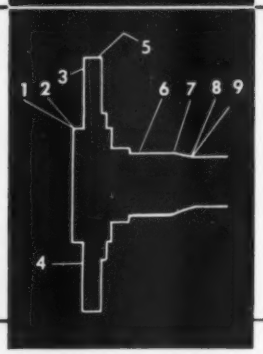




Four Heights
Tolerance: .002″

One four dial T-P CompAIRator checks four land heights simultaneously on this spool valve. Tilted line-type dials facilitate reading. Pointer action is positive, instantaneous. CompAIRators can be designed to check any specific tolerance range from .0001″ to .125″.





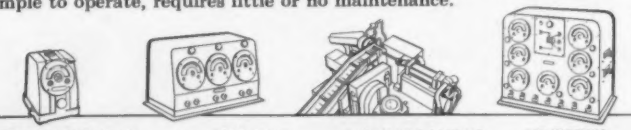
OD, Squareness, Runout, Concentricity
Tolerances: from .0005″ to .003″

This T-P CompAIRator combines air-electric, standard air, and computing air circuits to check 5 diameters, 2 runouts, one flatness, and one concentricity simultaneously on auto rear axles. Lights indicate dimensions out of tolerance. Exclusive T-P Computing CompAIRator circuits figure runout, flatness and concentricity. Eliminate usual four measurements and computations.

For more examples and the complete story on Taft-Peirce CompAIRator Air Gages send for Bulletin.

WHAT IS A COMPAIRATOR AIR GAGE?

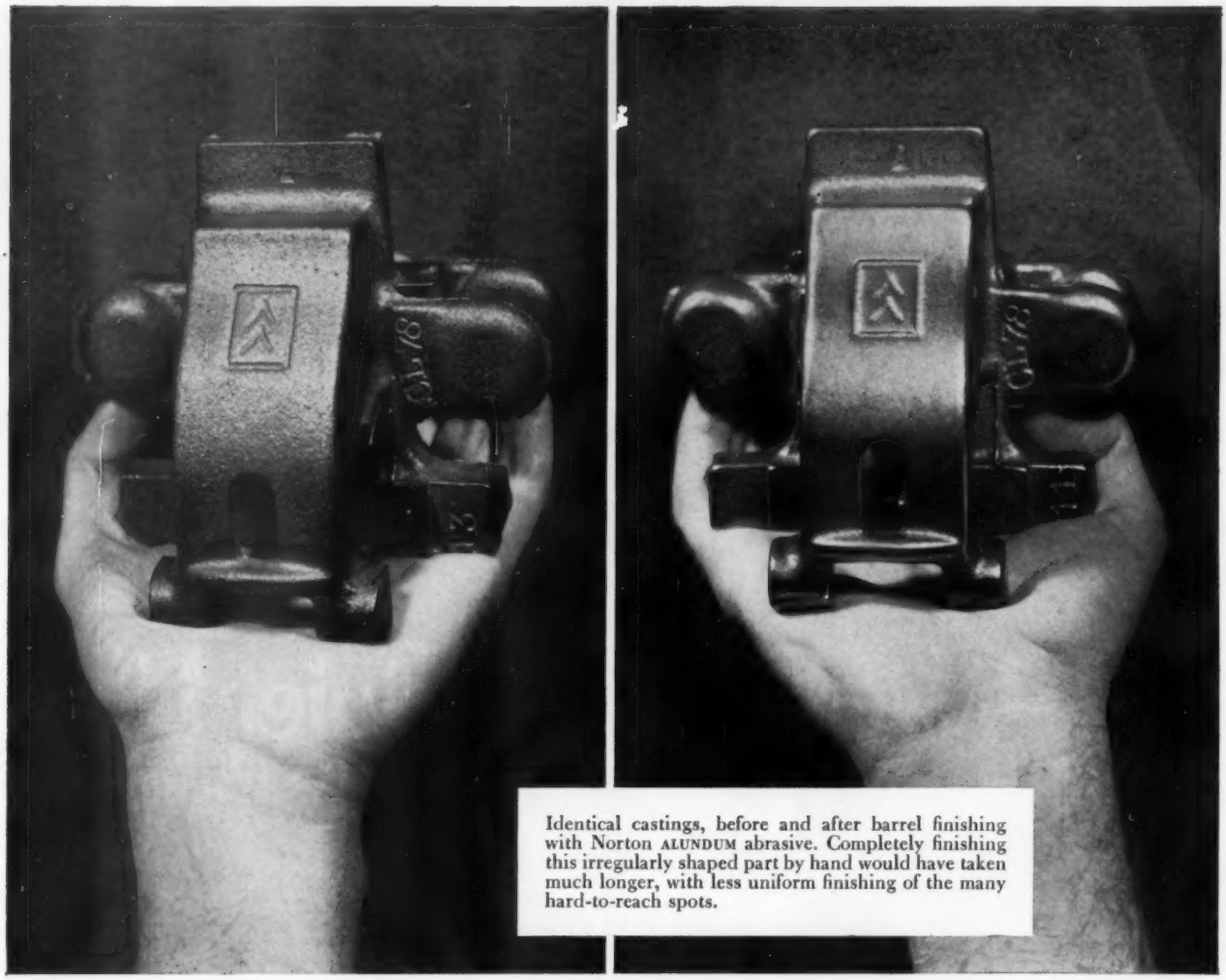
A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.



STANDARD AND SPECIAL COMPAIRATORS | COMPUTING COMPAIRATORS | AUTOMATIC SORTING MACHINE | AIR ELECTRIC COMPAIRATORS

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND



Identical castings, before and after barrel finishing with Norton ALUNDUM abrasive. Completely finishing this irregularly shaped part by hand would have taken much longer, with less uniform finishing of the many hard-to-reach spots.

ALUNDUM* tumbling abrasive tames another tough one!

Intricate parts finished faster, more thoroughly, when Norton abrasive adds the "TOUCH of GOLD"

The trickier, more intricate the parts, the easier it is to see the many advantages of barrel finishing with ALUNDUM tumbling abrasive. Hand finishing the casting illustrated, for example, would have been a long, tiresome chore — and an uneven job at best, due to the many irregularities of shape.

For parts ranging from even heftier castings down to tiny needles, there's nothing like ALUNDUM abrasive to bring out *all* the benefits of barrel finishing. This typical Norton abrasive development is sharp, dense, hard and non-fracturing. Its blocky shape eliminates slivers and chips in the tumbling process. In your tumbling barrels it assures:

- *Highest uniformity of radii and surfaces, with brightest, smoothest finish.*
- *Continual savings of man-hours, by reducing tumbling cycles, scrap and reworking to minimum.*

See Your Norton Distributor

for further facts on how ALUNDUM abrasive can add the time-saving, profit-boosting "Touch of Gold" to your finishing operations. Ask him for the new 55-page booklet on barrel finishing. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G287

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON

Making better products... to make your products better

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

For moderate counting duty, where extreme long life is not required, this new small reset counter is completely reliable. Compact and easily connected, this counter may be actuated by any type of switch, relay or photoelectric unit. Recommended speed is 700 counts per minute. Power consumption is low . . . *and so is the price* . . . but still the same Veeder-Root high quality. So here again is proof that you can count on Veeder-Root for any type of counter . . . electrical, mechanical or manual . . . for any type of duty in any field from atomics to electronics. What do *you* need to count?

Write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"The Name that Counts"

MODERN MACHINE TOOLS AREN'T AN

Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

GISHOLT JETRACER SIMPLIFIES CONTOUR BORING OPERATIONS

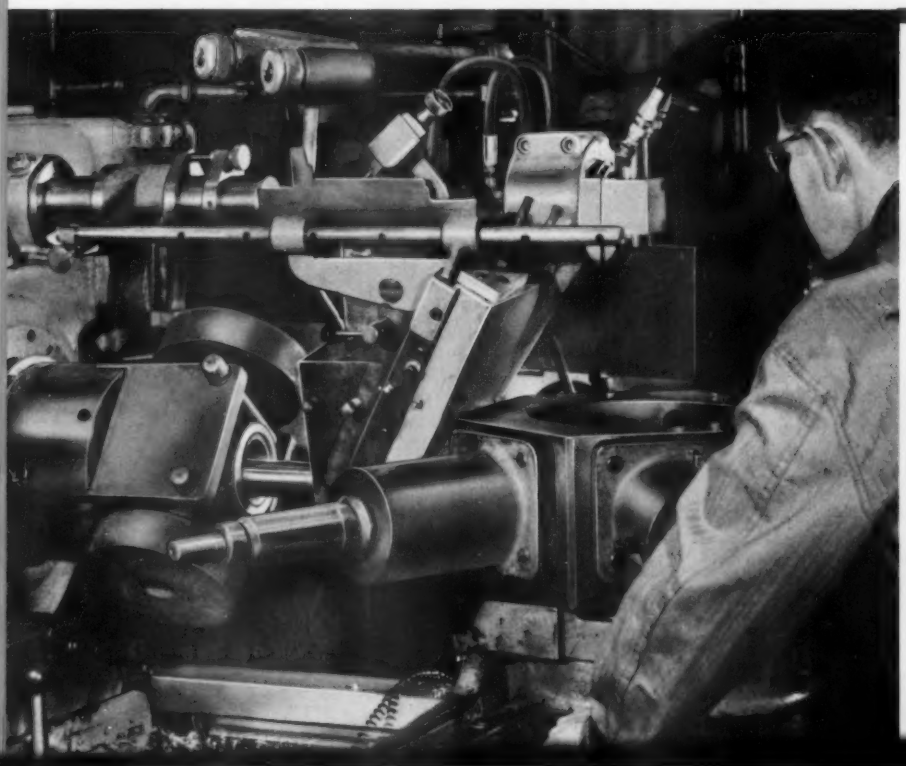
Low-cost Unit Added to Late Model Saddle Type Turret Lathe

How to get still more production and lower costs out of present equipment? Mission Manufacturing Company, Houston, Texas, can show you a good example in the machining of steel valve bodies.

The time and money saver is a hydraulic tracer unit, added to a Gisholt 3L Saddle Type Turret Lathe. Operation of the turret-mounted *JETRACER* is simple. The entire unit, including template, is self-contained and mounted on a single face of the hexagon turret. This in no way restricts use of the overhead pilot bar.

With the Gisholt *JETRACER*, production has been increased 25%. A low-cost, standard, single-point tool replaces expensive special sizing tools. Considerable time is saved on gauging, since only one diameter needs to be checked. Uniform quality is an added advantage automatically achieved, because the chance for human errors is done away with in boring operations.

New ideas pay off handsomely: Increased output plus repetitive accuracy in difficult boring operations result from this turret-mounted Gisholt JETRACER.



◀ Note template and stylus which follows contour for boring operation.

Typical workpieces, rough and finished, handled in this setup. ▼

EXPENSE — THEY'RE MONEY-MAKERS

GISHOLT TIME-SAVING IDEAS

GISHOLT

TIME-SAVING IDEAS

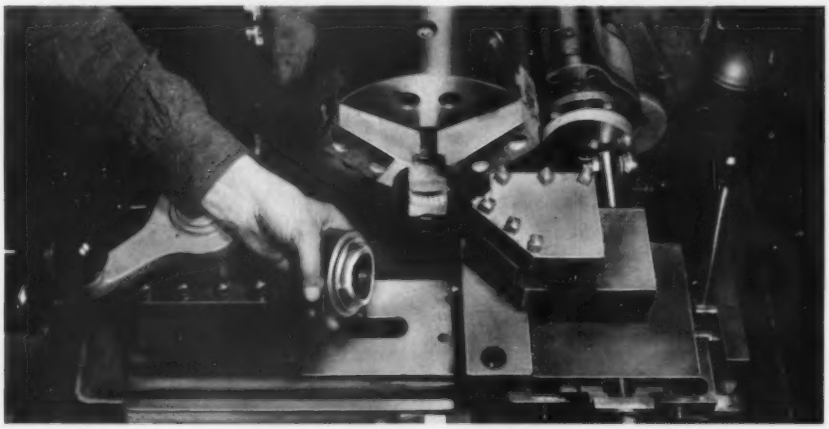
MODERN MACHINE TOOLS AREN'T AN

WAVE FACES EASILY GENERATED WITH THIS SLIDING TOOL BLOCK SETUP

Simple Solution to Unusual Job on a Ram Type Turret Lathe

Talk about tricky shapes to generate, look at this lug insert forging. Yet it's easily done with this setup on a Gisholt No. 5 Ram Type Turret Lathe.

This close-up shows sliding tool block arrangement on the No. 5 Ram Type Turret Lathe.



For chucking there is a spring-loaded locator in the spindle for correct radial location on the rib on the back of the part. Tools on the hexagon turret drill, bore, co-bore, rough turn, undercut and chamfer.

The problem surfaces are generated by tools in a special sliding tool block on the rear of the cross-slide. The block is actuated by a cam which rotates in time with the spindle. A spring-loaded roller attached to the sliding tool block follows the contour of the face of the cam, causing tools to perform contour machining on the workpiece.

Expert tooling with sliding tool block arrangement and the use of the right machine give a low 4.3-minute f. t. f. time including this unusual facing job.

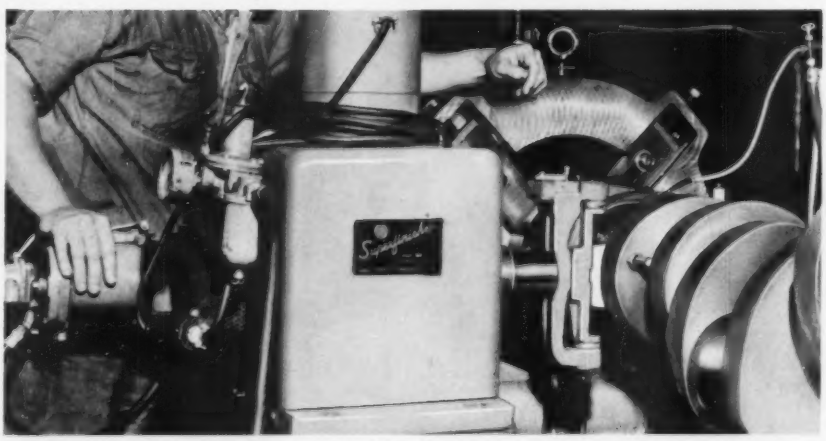
LARGE CRANKSHAFTS SUPERFINISHED WITH LOW-COST LATHE ATTACHMENT

Better Wearing Surfaces Achieved Without Adding Extra Operation

To get the longer bearing life demanded of crankshafts in today's higher speed diesel engines, this manufacturer uses Superfinish...and at a minimum of equipment cost.

The main and crankpin bearings are turned on a lathe to .001-inch tolerance. Then, without removing the crankshaft from the lathe, a Gisholt No. 4 Superfinishing Attachment, which has been substituted for the front tool post, is used to Superfinish these vital surfaces down to 10 micro-inches RMS. The required micro-inch surface finish is produced without an intermediate grinding operation.

You can see the savings in time and equipment by this setup. The quick Superfinishing operation exposes true base metal so that the crankshaft operates on harder, smoother bearing surfaces for a longer trouble-free service life.



With Superfinisher attachment mounted on the lathe, machining and Superfinishing jobs are done in one chucking.

Finer bearing surfaces and improved geometry by Superfinishing make these crankshafts better performing—at less cost than former finishing methods.

Helpful Catalog, recently printed, gives explanation of Superfinish and shows many applications. Write for your copy.

Your New Machine Tools—
Cash?...On Time?...Lease?

What's the most practical way for you to obtain new machine tools? You have a choice of several plans... all clearly explained and illustrated with examples in this new bulletin. Ask for your copy of Form P-1173, "What You Should Know About Buying and Renting Machine Tools."

GISHOLT

LOOK AHEAD...KEEP AHEAD...WITH GISHOLT

EXPENSE...THEY'RE MONEY-MAKERS

GISHOLT

TIME-SAVING IDEAS

HOW BRAKE DRUM OUTPUT WAS INCREASED 50%

Precision Taper Boring Extra Benefit of Fastermatic Automatic Turret Lathe

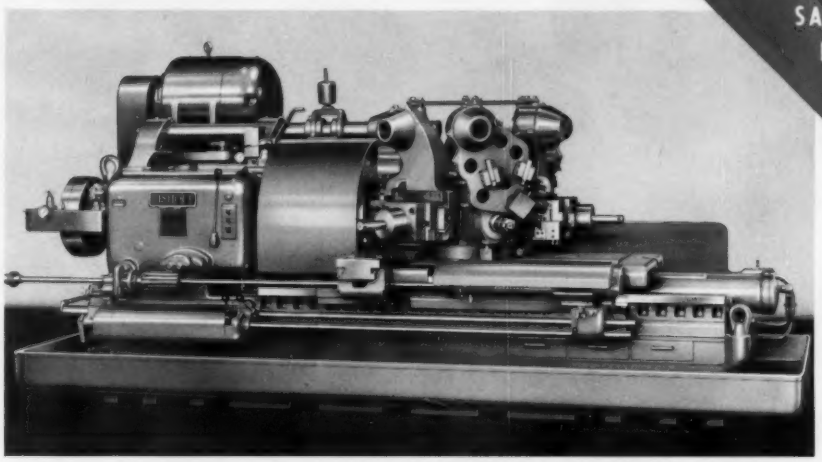
Greater output and greater precision were the objectives when refiguring this job...machining road grader brake drums.

The job is now handled on a Gisholt 4F Fastermatic Automatic Turret Lathe. This is equipped with special jaws to compensate for uneven chucking surfaces and hold the drum rigidly for the multiple cuts.

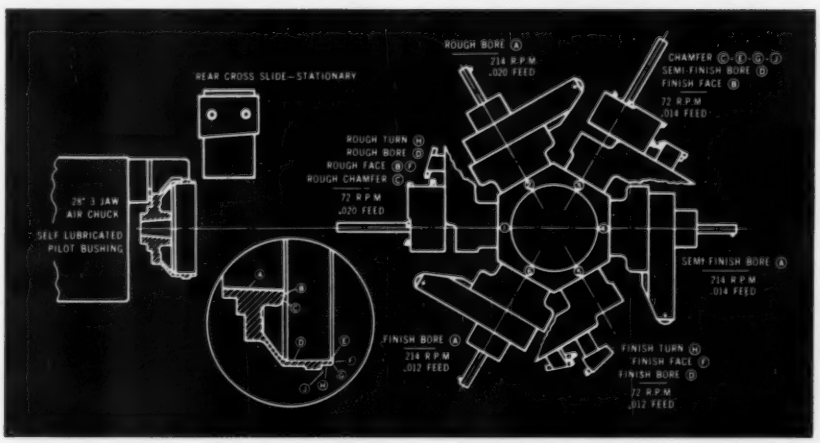
Taper boring (A) is done with a boring bar and cutter mounted in a turret facing slide tool. Three of these slide tools are used with a special cam block mounted on the stationary rear cross-slide which guides the spring-loaded slide tools along the taper angle of the bore. Result is precision gauge fit every time. These slide tools are alternated on the turret with other standard tools which bore, face, chamfer, and turn other sections of the drum.

The large parts are completed in 23.1 minutes—a 50% reduction in f.t.f. time of the former method.

The Fastermatic has the right combination of rigidity, accuracy and automatic features to provide important time- and labor-savings on this job.



Gisholt 4F Fastermatic Automatic Turret Lathe



EASIER CALIBRATION SPEEDS BALANCING OPERATION

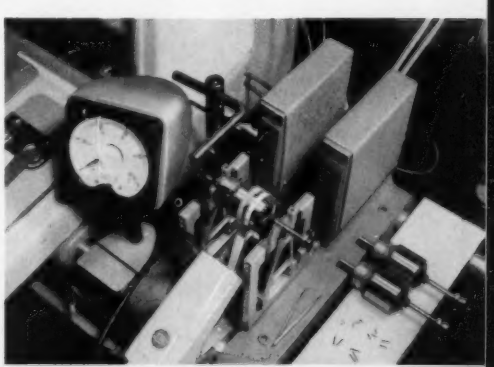
Amount of Required Correction Directly Indicated on Gisholt DYNETRIC Balancers

Production balancing of universal motor armatures is generally at a rate of 125 parts per hour, including measurement, correction and inspection. Fast, accurate, easy-to-operate equipment is a necessity.

This manufacturer uses a Gisholt OSB Bench Balancer to dynamically balance every armature. Six different sizes of extruded aluminum strip are used to correct for balance. The direct reading amount meter, calibrated so that one unit represents the smallest strip, quickly indicates which of the six sizes must be used to produce balance.

It takes only 15 seconds in this case to determine accurately which strips are to be used and the positions in which they are to be placed at each end of the armature. Can you imagine anything easier?

Gisholt Balancing Machines offer many fine features which add up to quick, accurate, low-cost balancing operations. Ask for your copy of new general balancing catalog, No. 1109-A.



DYNETRIC BALANCERS GISHOLT

DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TALK TO GISHOLT ABOUT MACHINE TOOL LEASING

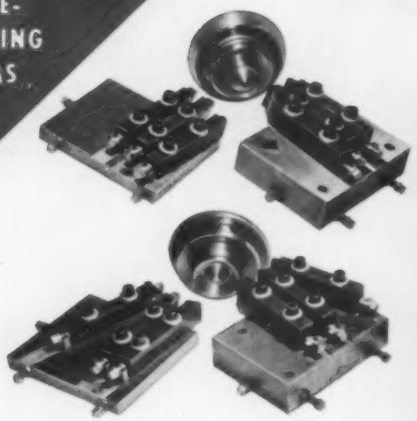
GISHOLT

GISHOLT

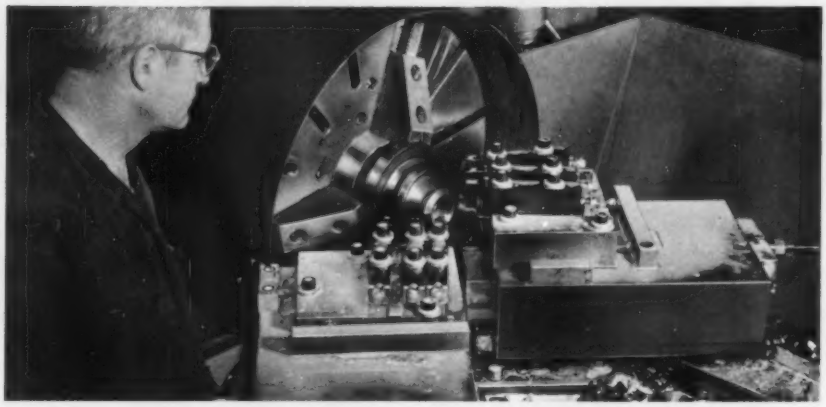
TIME-SAVING IDEAS

TIP FOR FAST CHANGEOVERS... PRE-SET TOOLING LIKE THIS

How a little extra planning saves a lot of money —with the Gisholt Simplimatic Automatic Lathe



(Right) Tooling for one type cutter bit. Photos above show pre-set tooling for two other types.



Here three different types of steel oil well cutter bits, each in two sizes, must be handled. Good reason for carefully planning changeover.

The solution is nicely provided by a Gisholt Simplimatic Lathe and pre-set tooling. Each type of cutter bit has its own tooling which is set before being mounted on the tool slides. Special tool bits are bolted in milled slots on steel spacer plates. These are then mounted on the slides. The Simplimatic's front and rear slides have swivel bases to facilitate correct angular adjustment. Time for workpieces shown in photos is only 2.40 minutes.

Changeover with pre-set tooling on the Simplimatic saves time in handling these six different workpieces.

SPECIAL TOOLING COMBINES TWO OPERATIONS IN ONE CHUCKING

No. 12 Hydraulic Lathe Uses Auxiliary Slide to Form Grinding Relief

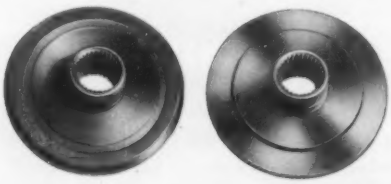
Headstock-mounted slide feeds tool at 45 degree angle to form grinding relief. (tailstock retracted to show tooling)

How to finish these steel turbine converter hub forgings in one chucking with a minimum of special tooling?

First, the work is chucked in the splined I.D. on a special splined mandrel, the end of which rotates slightly off-center to grip and drive the part. A tailstock provides additional support.

Tooling on the front carriage and rear independent slide finish turns the two hub diameters, finish faces the flange and sizes the pilot diameter. Since the front carriage and rear slide are used for standard machining operations, they are not available for forming the grinding relief between the hub diameter and its adjacent face. Instead, a headstock-mounted auxiliary slide is used. Movement of the front carriage actuates this slide which feeds in at a 45 degree angle to form the grinding relief.

Floor to floor time is only .4 minute with the auxiliary slide permitting the part to be finished in one chucking.



Rough and finished workpieces showing surfaces machined in this operation

An extra operation is saved by this relatively simple auxiliary slide arrangement on the No. 12 Hydraulic Automatic Lathe.

No. 3-455

635

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

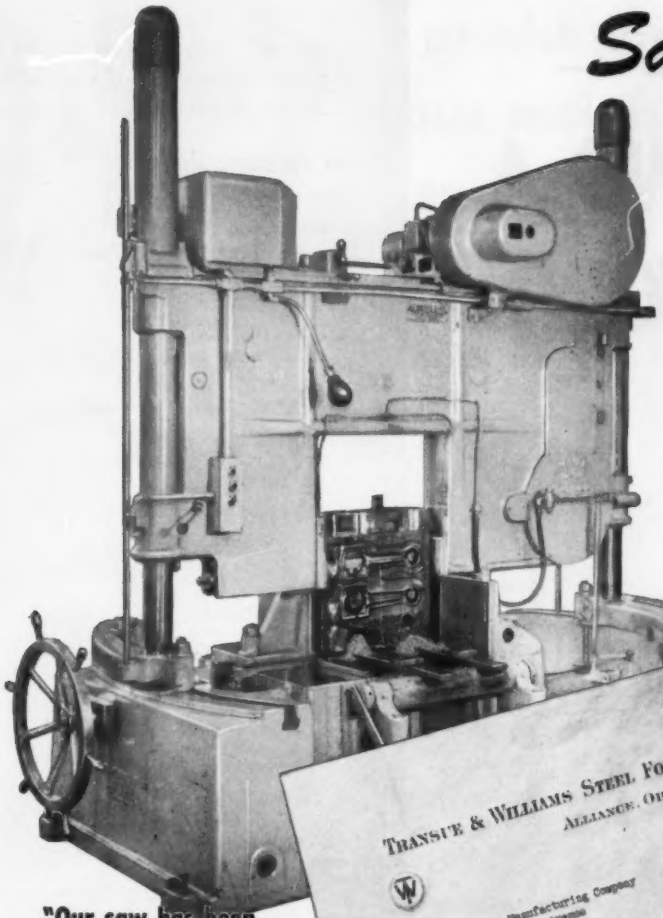
GISHOLT

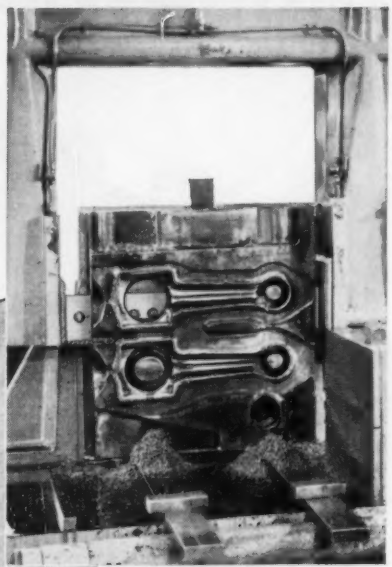
GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

TALK TO GISHOLT ABOUT MACHINE TOOL LEASING

Save 25% Time in Re-facing Dies... 20% Time -plus steel- in Shanking Them





Trimming the worn impression from the face of a 20" x 24" die block with a No. 24 MARVEL Universal Hydraulic Roll Stroke Hack Sawing Machine. Average Blade Cost $.0108 per square inch.

"Our saw has been in operation 2 years. Most of our sawing has been on die blocks..."

"We are removing the worn impression from the face of die blocks for re-inking ... we recently removed 2 inches from face of blocks measuring 19" x 17" ... sawing time 296 minutes for 2 blocks ... Set up time 31 minutes ... grinding time 155 minutes ... total 8 hours and 2 minutes.

"Average time for removing same amount of stock from these die blocks with planer, 10 hours and 15 minutes. Sawing saves approximately 25% of time ...

"With regard to removing excess stock to provide shanks ... we remove approximately 90% of metal by sawing after which block is sent to planer for finishing. Time for sawing and planing is 20% less than planing alone.

"Pieces of stock removed by sawing are useful in many ways ... saves buying of some trimmer steel."

TRANSUE & WILLIAMS STEEL FORGING CORPORATION
ALLIANCE, OHIO

Armstrong Blum Manufacturing Company
5706 W. Bloomingdale Avenue
Chicago 39, Illinois

Gentlemen:

We felt that you would be interested in having some of the data we have compiled on our 24 x 24 Marvel Metal Cutting Saw. As you know, our saw has now been in operation approximately two years. Most of our sawing has been on die blocks furnished us either by the Heppenstall Company of A. Finkl & Sons Company.

We wish to advise you that we are removing the worn impression from the face of die blocks for re-inking with the use of this saw and find that it works to a very definite advantage, depending somewhat on the amount of stock to be removed from the face of the die. On a job which we recently re-moved two inches from the face of blocks measuring 19 x 17", our sawing time was 296 minutes for the two blocks, set-up time was 31 minutes, and the time required for grinding the face after sawing was 155 minutes, total 482 minutes or 8 hours and 2 minutes. To remove the same amount of stock from these blocks with our planers, over an average of eight sets of dies required 10 hours and 15 minutes for planing and grinding, or approximately 25% additional time. We might point out that our labor rate for a saw operation is less than that being paid to a planer operator, which increases the saving somewhat. From our experience, we find where only one inch is to be removed from the face of the die, the saving is somewhat less, but in our case has been very definitely in favor of the saw.

With regard to removing the excess stock to provide shanks on our dies, this naturally varies with the size of blocks and the depth of the shank involved. However, our average over a year and a half period has indicated to us a saving of 20%; in other words, we remove approximately 90% of the metal by sawing, after which the blocks are sent to the planer for finishing the shanks. The total elapsed time for the sawing and planing we have found to be 20% less than that required by planing alone. We should also like to point out that the pieces of stock removed by the sawing are useful to us in many ways and has eliminated the necessity of buying some of our trimmer steel.

Perhaps you also would be interested in our blade life and blade cost. We have found that with an original blade and having it reground twice, we are able to cut 2,850 square inches. The cost of the blade being as

...m of this would be.

...ure,

...STEEL FORGING CORPORATION

Factory Manager

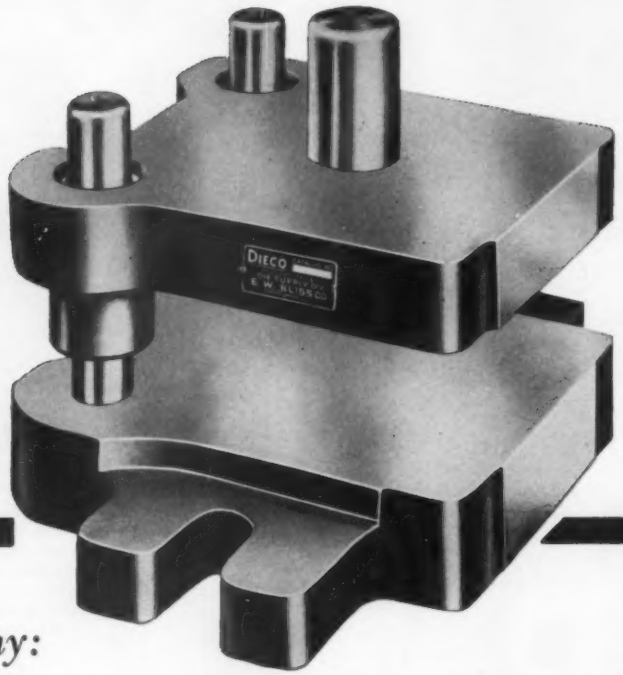
Write for Catalog of MARVEL Modern Metal Saws

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 W. BLOOMINGDALE AVE. CHICAGO. (39) U. S. A.

the favorite die set of the midwest is—

RAPIDLY BECOMING A NATIONWIDE FAVORITE!



here's why:

- Hardened steel pins are rough and finish ground, then *super-finished.* Closer tolerances give more accurate guiding.
- High-tensile steel plates are first *stress-relieved*, then precision machined—perfectly parallel, they stay parallel under load.
- All parts electronically gaged for perfect fit.
- Choice of bronze-lined on hardened steel backing or hardened steel bushings—all with grease fittings. Precision ground and micro-honed to less than a "tenth" tolerance; can be arranged for pressure lubrication.
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- 1728 combinations in steel or semi-steel—interchangeable parts speed delivery.

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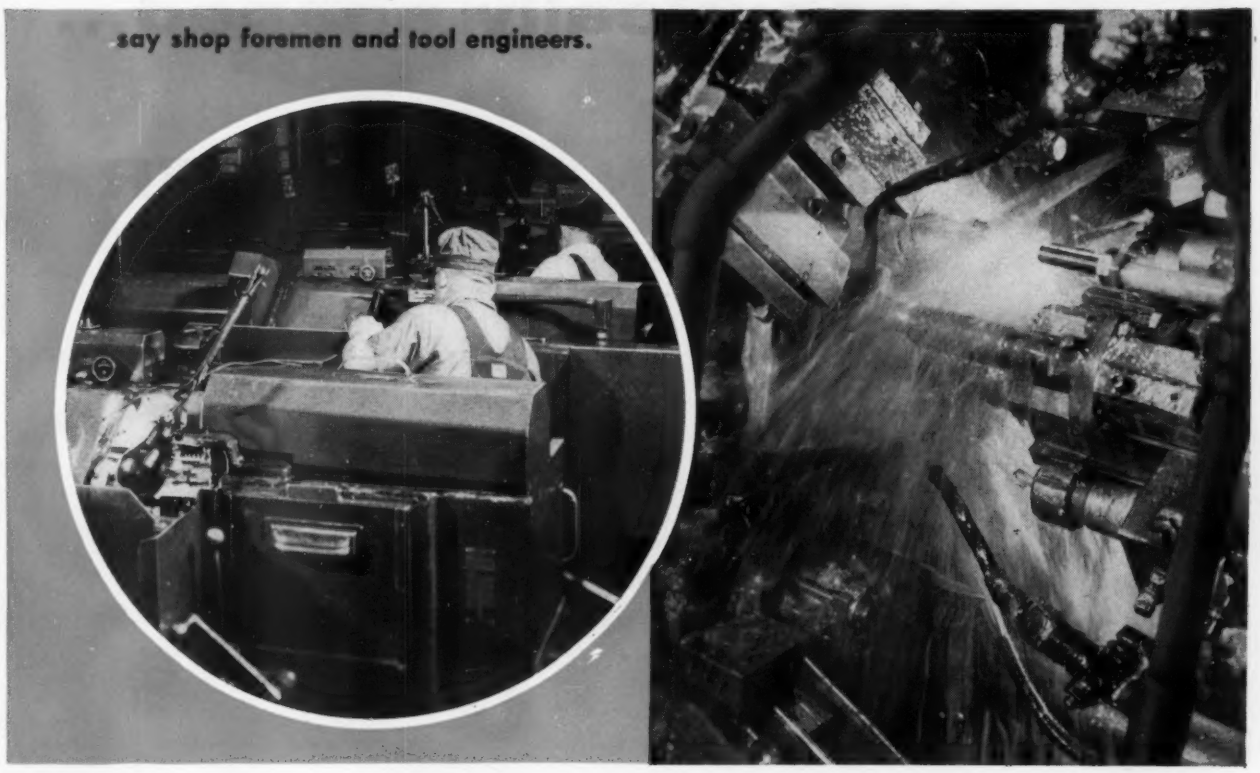

Here are a few typical examples of the results reported by machine shops since they switched to Gulf Cut-Aid:

- " . . . does a better job on aluminum than any cutting fluid we've ever used."
- ". . . proved superior to 12 other cutting oils we tested. We got 10% greater production, 50% longer tool life;"
- ". . . upped production from 700 to 1000 parts per hour;"
- ". . . rejections entirely eliminated, production increased 20%."

Results like these are possible because Gulf Cut-Aid has a high rate of penetration, good "wettability," and excellent cooling properties. It also contains an effective anti-oxidation additive which helps prevent gum and sludge formation in the coolant system. And it will not corrode or stain metals.

In addition Gulf Cut-Aid is an effective energizer for other cutting oils, regardless of type or viscosity. This blending makes possible higher production speeds and results in improved finishes and longer tool life.

Have a Gulf Sales Engineer show you how Gulf Cut-Aid and other Gulf quality cutting oils shop. Call him today at your nearest Gulf office, or send the coupon below.

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1822 Gulf Building, Pittsburgh 30, Pa.

Please send me a copy of your pamphlet describing the uses of Gulf Cut-Aid.

Name.....

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die blocks accurately economically shaped...

on a CINCINNATI SHAPER

at the **DROP DIES AND FORGINGS CO.,** Cleveland, Ohio

Accuracy and convenience make money for this customer. This accurate Cincinnati Shaper and the convenient special die block vise are factors in this economy.

Some more Cincinnati money making features:

- Smooth operating Magnetic-clutch and Brake.
- Automatic high pressure oiling (50 P.S.I.).
- Multiple cam feed.
- Extended ram bearings.
- Solid ram ways integral with column.
- Single adjustment full length tapered gibs.

Write for Shaper Catalog N-6.

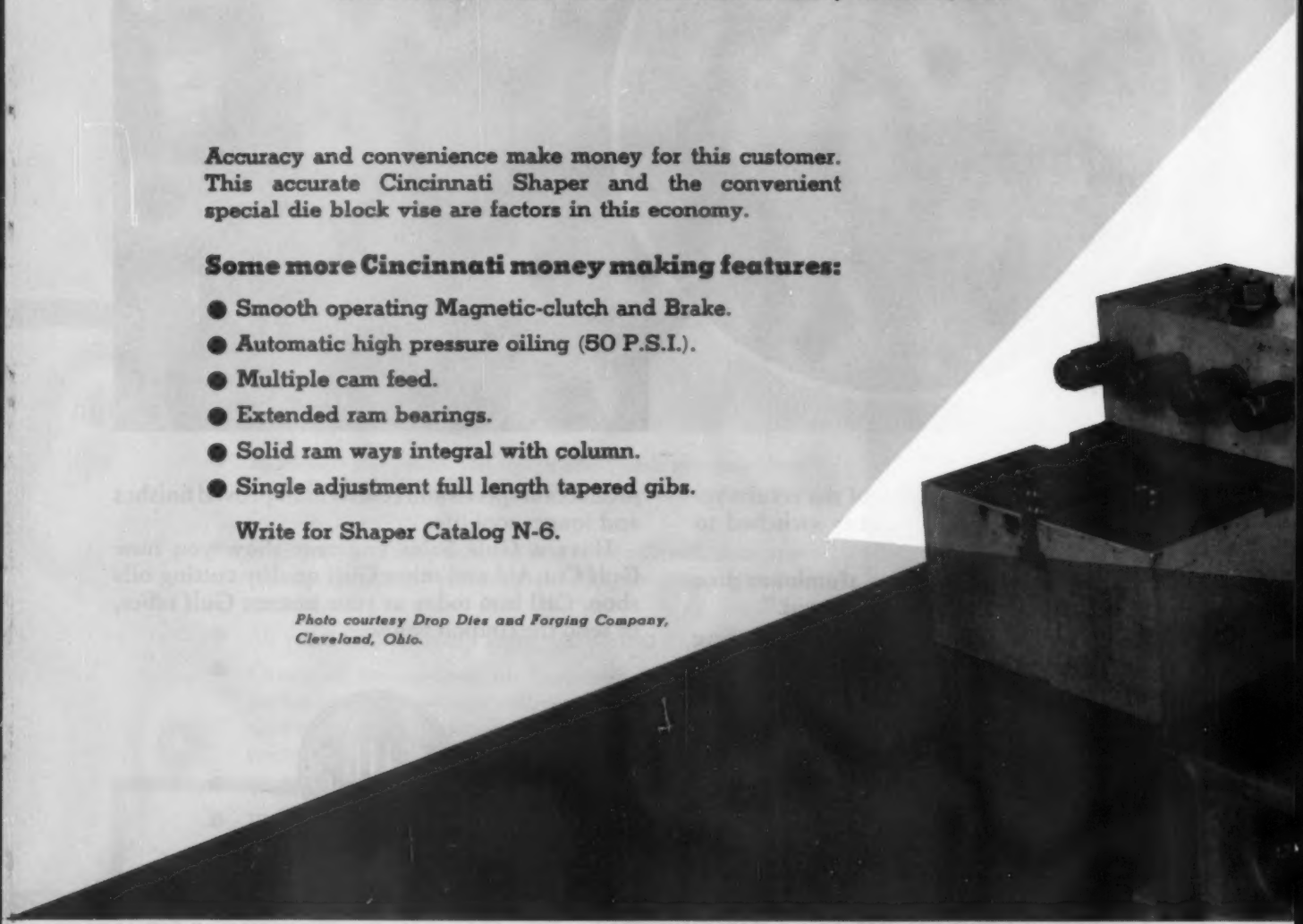

Photo courtesy Drop Dies and Forging Company, Cleveland, Ohio.

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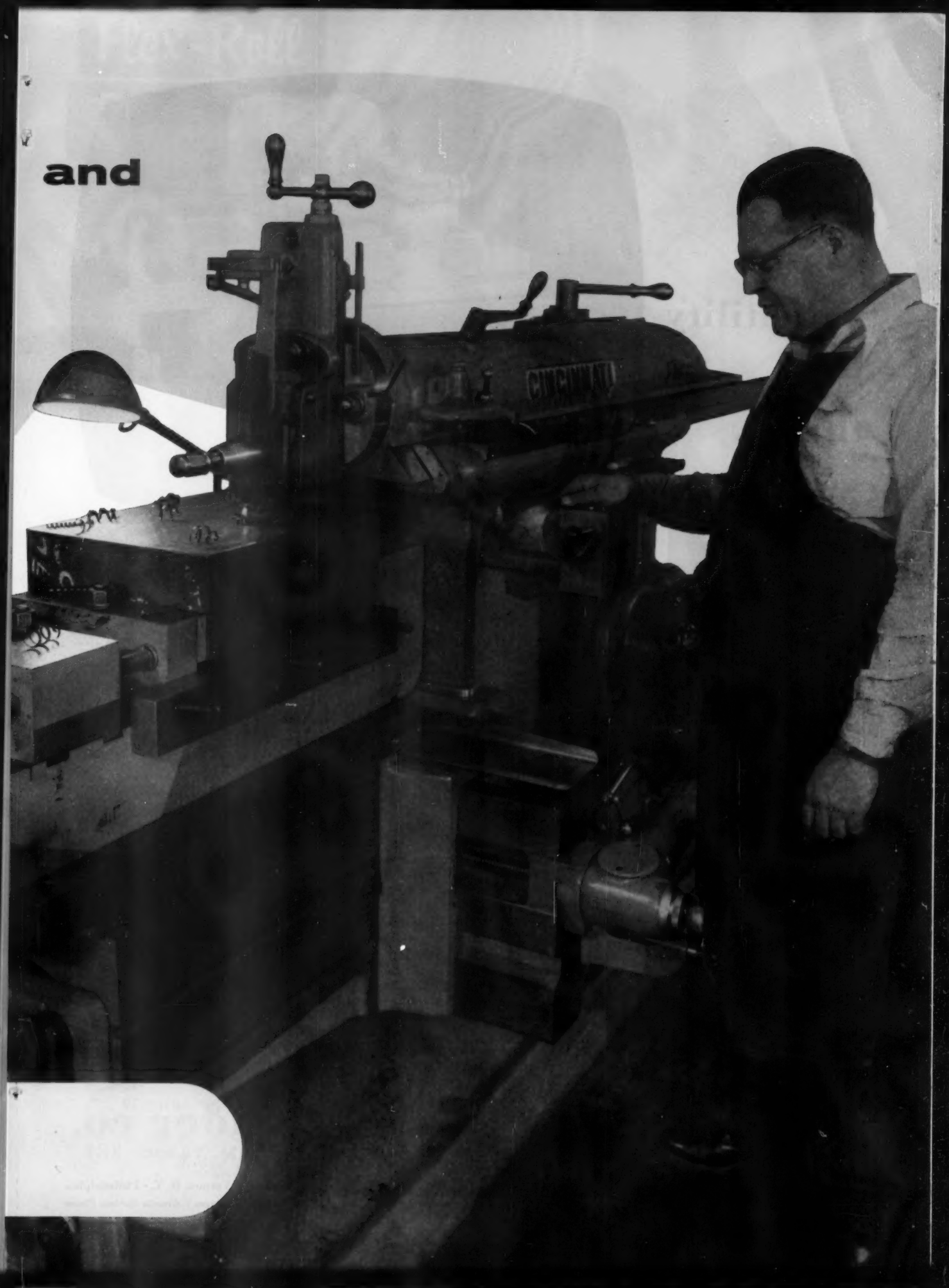
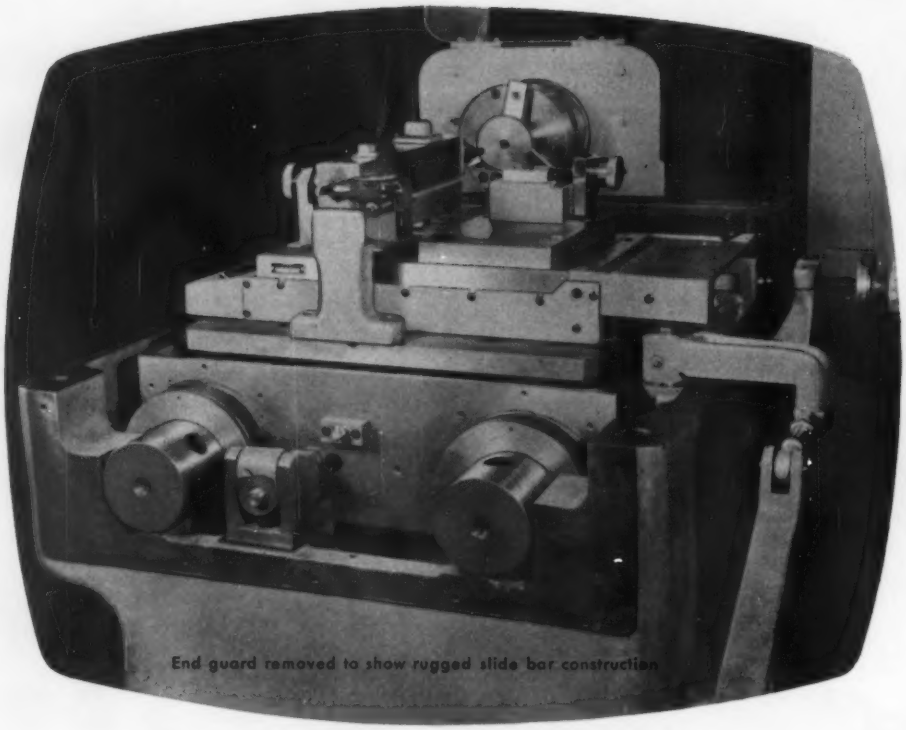
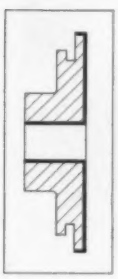


Flex-Roll

Get versatility like this...


End guard removed to show rugged slide bar construction

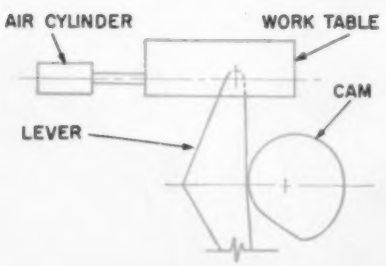
...on the BRYANT 998 precision boring machine!



Part—Gear blank, 1045 steel, 18 to 20 Rockwell "C"
Operation—Bore .4955 +.0005, 1 3/16" long
Turn 3.000 —.002, 1/8" long
Finish face
Stock removal—.007 to .010
Cutting speed—1250 R.P.M., 800 S.F.M.
Feed—5 I.P.M. on diameters, 3 1/4" to 7 3/4" on face
Lead—.004 on diameters, .003 to .007 on face
Finish required—40 to 60 micro-inches
Production—74 pieces per hour at 100%

Tooled to do five different gear blanks, the Bryant 998 shown above, bores, turns, and faces short run lots economically and with highest repetitive accuracy.

A wide range of operations—precision boring, drilling, turning, facing—plus contour turning and boring can be done at peak production rates on the Bryant 998.



The Bryant 998 is designed to allow rapid interchange of fixtures and tooling for machining a wide variety of parts. Its table is actuated mechanically by a precision cam and lever unit—providing positive control of the cycle at all times. This feature also eliminates variation due to temperature change of a hydraulic system.

The table's smooth, uniform motion assures fine finishes. The table moves on two 4"-diameter solid steel slide bars firmly bolted to the bed and is supported by two anti-friction pre-loaded ball bearings on each of the bars. This construction provides a metal-to-metal contact which eliminates shifting due to oil film. *Write for Bryant 998 Job Folder.*

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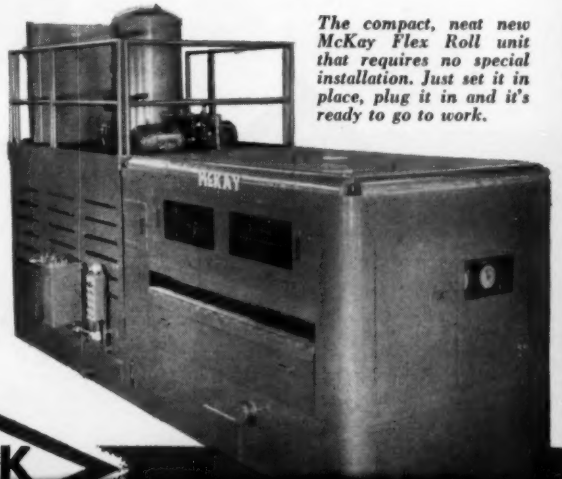
Absolutely Essential
FOR BETTER DEEP DRAWS

THE Automotive and Appliance industries have long been aware of product improvement due to Flex Roll Processing. Low carbon steel as supplied by the steel mills for deep drawn parts, requires a cold working prior to the press operation, to eliminate stretcher strain, improve surface appearance and minimize scrap losses.

The new McKay Flex Roll Processor combines thorough cleaning with efficient filtering of cleaning fluid and effective cold working of the steel sheet to prepare it for severe deep draws.

McKay engineers will appreciate the opportunity of demonstrating the benefits of Flex Roll Processing.



The compact, neat new McKay Flex Roll unit that requires no special installation. Just set it in place, plug it in and it's ready to go to work.

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Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the new additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off, etc., etc.

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Now, you can have one source of supply for *all* your cutting fluids—fluids that will not only *lower costs . . . but do a better job.* Meet the entire family of *nine* Cimcool products, each one uniquely designed to serve a purpose in industry—each one developed in the laboratory and proved on the job:

CIMCOOL STANDARD CONCENTRATE—The famous pink cutting fluid which still covers 85% of all metal cutting jobs.

CIMCOOL S-2 CONCENTRATE—For heavy duty use.

CIMCOOL WATER CONDITIONER—For increased rust control.

CIMCOOL TAPPING COMPOUND—The magic compound that increases tap life amazingly.

CIMCOOL TRANSPARENT GRINDING FLUID—For superior rust control at high dilutions.

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CIMCOOL MACHINE CLEANER—The 2-phase non-corrosive cleaner that cuts grit, dirt, slime and oil.

CIMCOOL BACTERICIDE—The most effective agent yet developed to overcome rancidity.

Our representatives will be happy to give you full details about these nine great products now serving industry 100% . . . and to prove to you, through actual demonstration, that Cimcool products *lower costs—and do a better job.*

Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire, or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

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100% for ~~85%~~ of all metal cutting jobs

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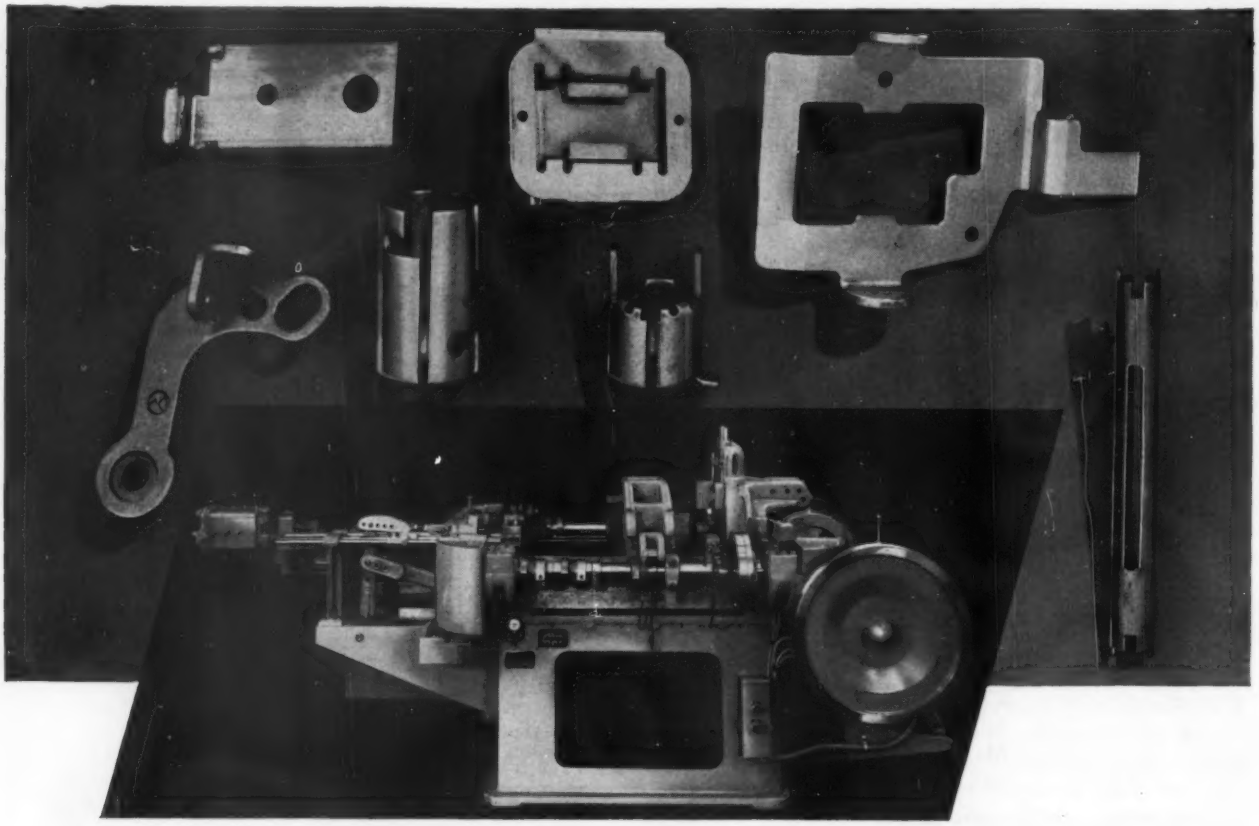

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U. S. Multi-Slide Machines are built in four sizes. Illustrated above is the No. 33 Machine, with capacity for material up to 2½" wide and feed length adjustable up to 12½". If your program involves the production of precision stampings, investigate the labor-saving, time-saving features of U. S. Multi-Slides.

Ask for a copy of Bulletin 15-A containing complete specifications.

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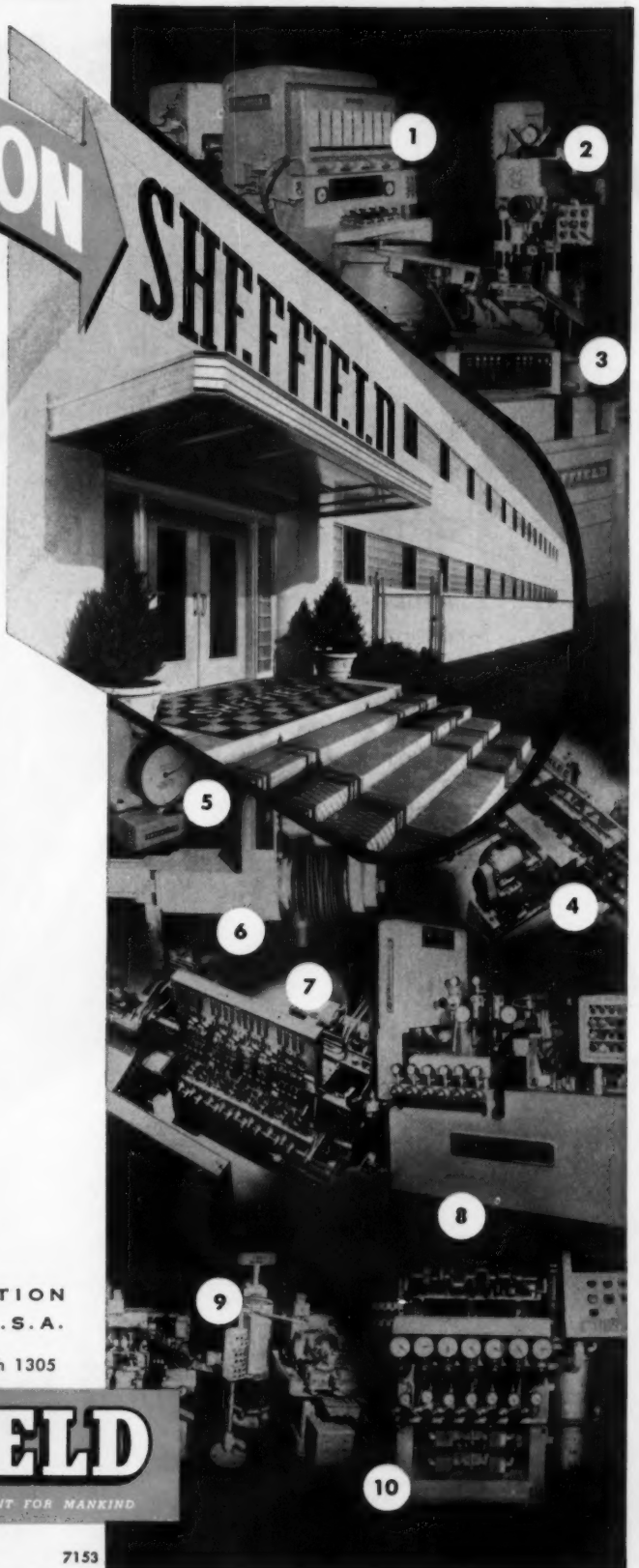

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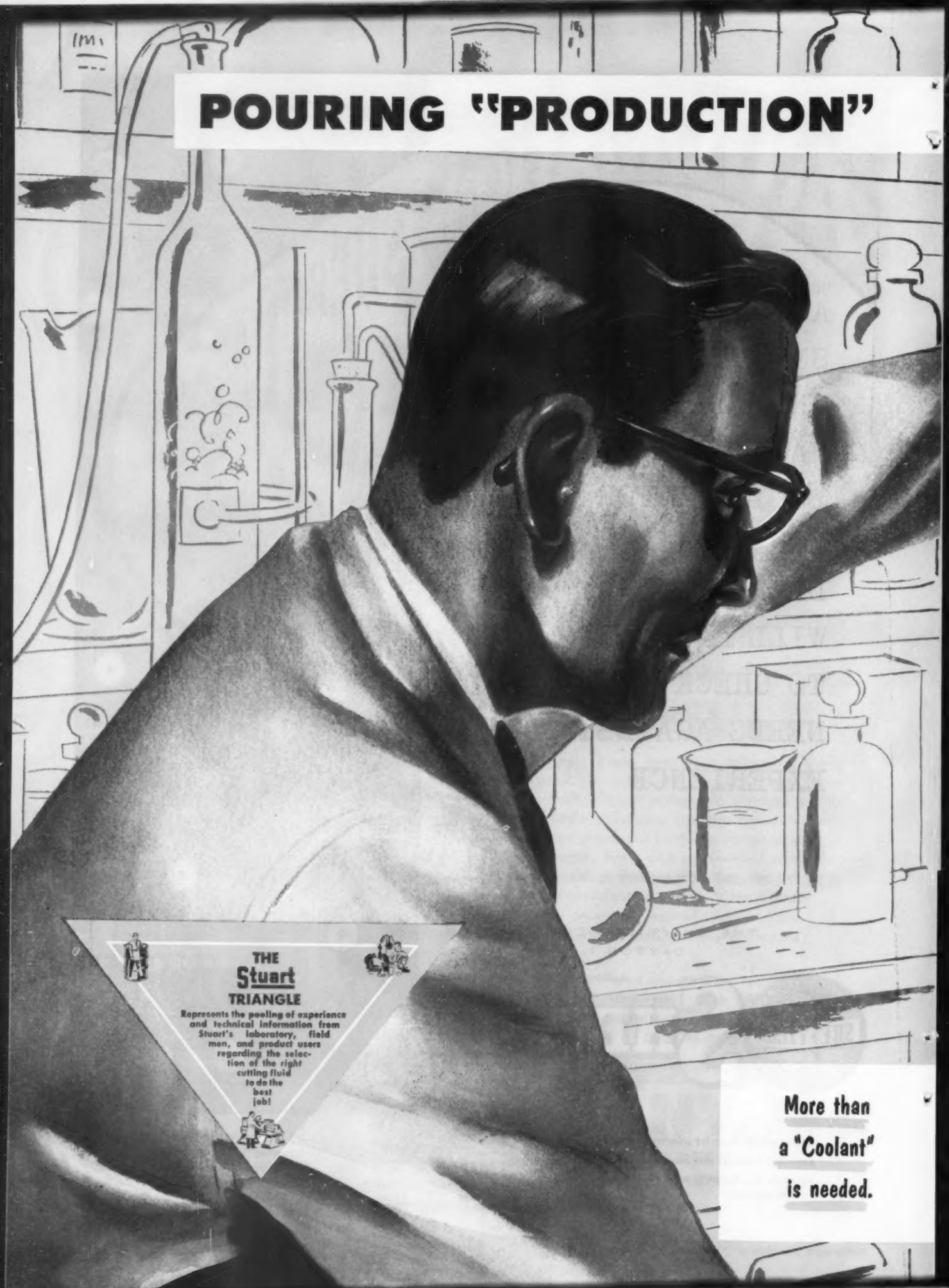
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More than a "Coolant" is needed.

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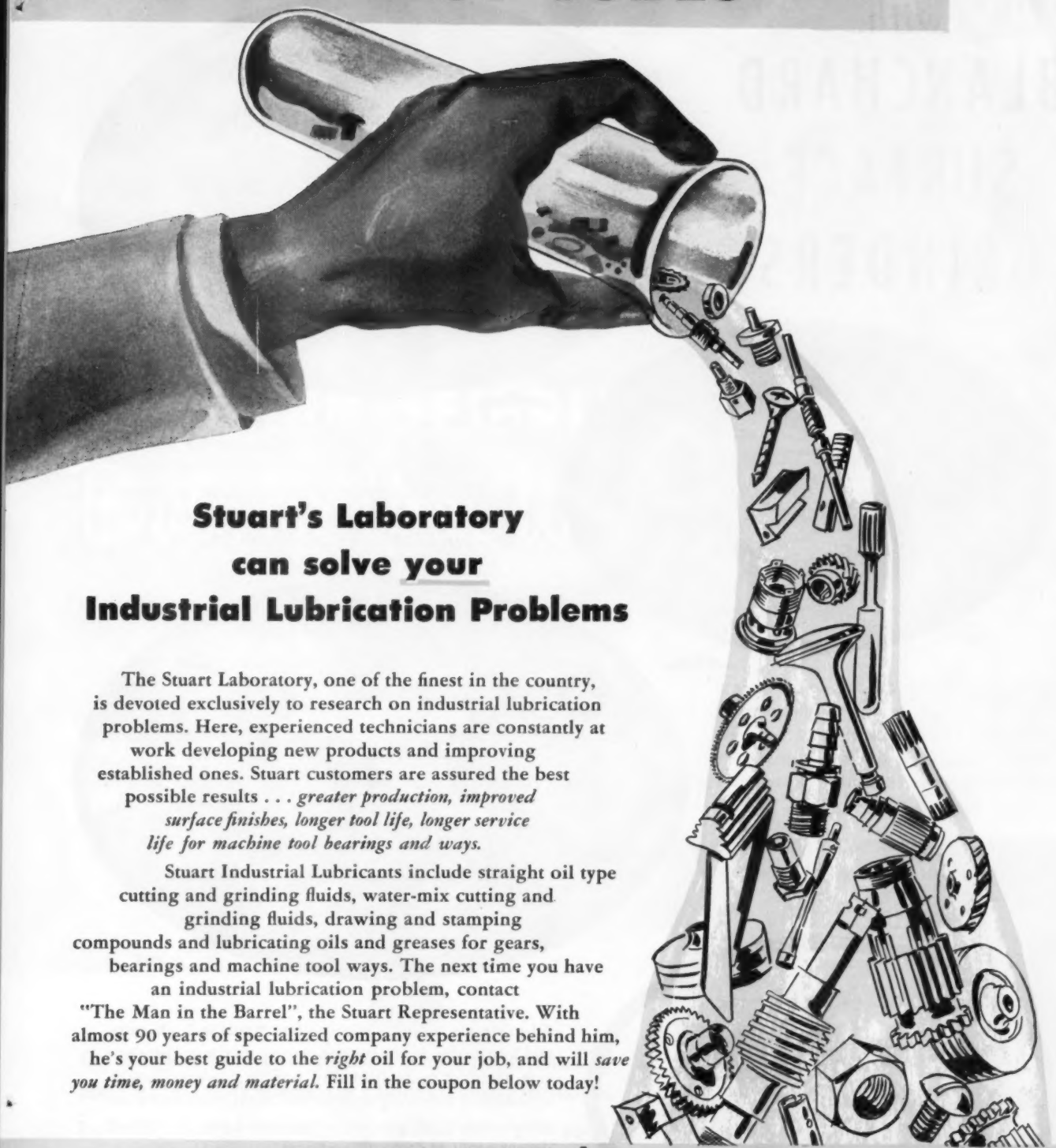

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with BLANCHARD SURFACE GRINDERS

W-1102

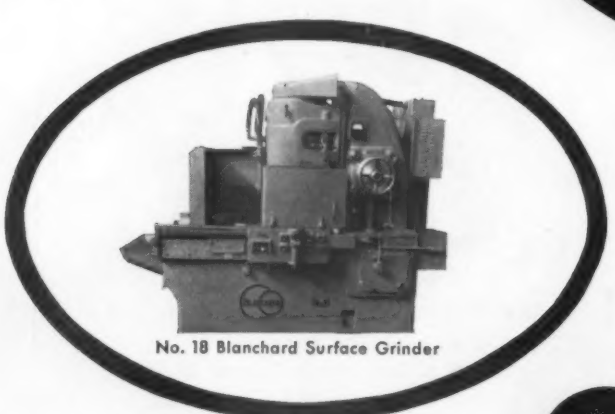
Blanchard surface grinders are noted for their ability to save time and labor in machining flat surfaces. For example, a No. 18 Blanchard machines the steel blocks shown above at the rate of 4 cubic inches per minute . . . and produces finished tolerances for flatness, parallelism and dimension of .001" to .002"!

W-815

By dressing the chuck and using the correct wheel, the same Blanchard will finish grind pump parts to a flatness of .0002" . . . with surface finish of 4 to 6 micro-inches . . . at a rate of 40 pieces (80 surfaces) per hour!

Blanchard ground to make *tight* joints! These valve plates are used in refrigerator compressors.

W-802



No. 18 Blanchard Surface Grinder

Obsolete machining methods often result in high costs and low profits. If you are not getting maximum production, consider using Blanchard surface grinders. They're economical, extremely accurate and highly productive on a wide variety of jobs. And they enable you to make a decent profit at competitive prices.

Send for free copies of "Work Done on the Blanchard", (fourth edition), and "The Art of Blanchard Surface Grinding".

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Grinding small holes with an Ex-Cell-O 25,000 RPM High Frequency Motorized Spindle

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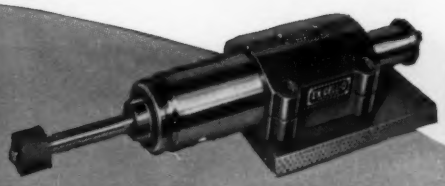
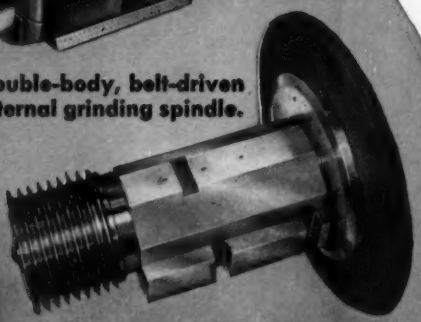


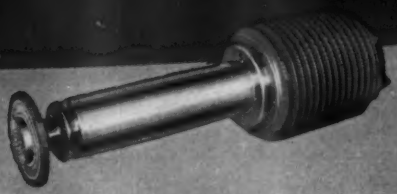
Single-body, belt-driven internal grinding spindle.

Double-body, belt-driven internal grinding spindle.

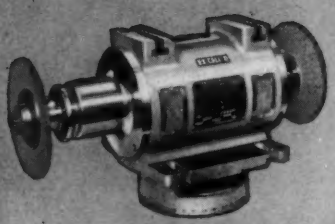


25 hp heavy duty precision spindle with 24" grinding wheel.

25,000 rpm high frequency inbuilt motor spindle.



Totally enclosed inbuilt motor surface grinder spindle.



Precision inbuilt motor spindle for cutter grinder.

Heavy duty motorized precision spindle available up to 20 hp

Get the most from your precision grinding operations by using the Ex-Cell-O Spindle that's made especially for the job.

Ex-Cell-O Precision Spindles have long been the original equipment choice of leading grinder manufacturers. They are rigid and smooth-running. For high precision work they are fitted with standard Ex-Cell-O Precision Ball Bearings; for slower speeds and heavier cuts they are equipped with heavy-duty Ex-Cell-O Precision Ball Bearings. They require no lubrication or adjustment. Phone your Ex-Cell-O representative or write to Ex-Cell-O in Detroit today for catalog 25962 listing hundreds of standard grinding spindles.

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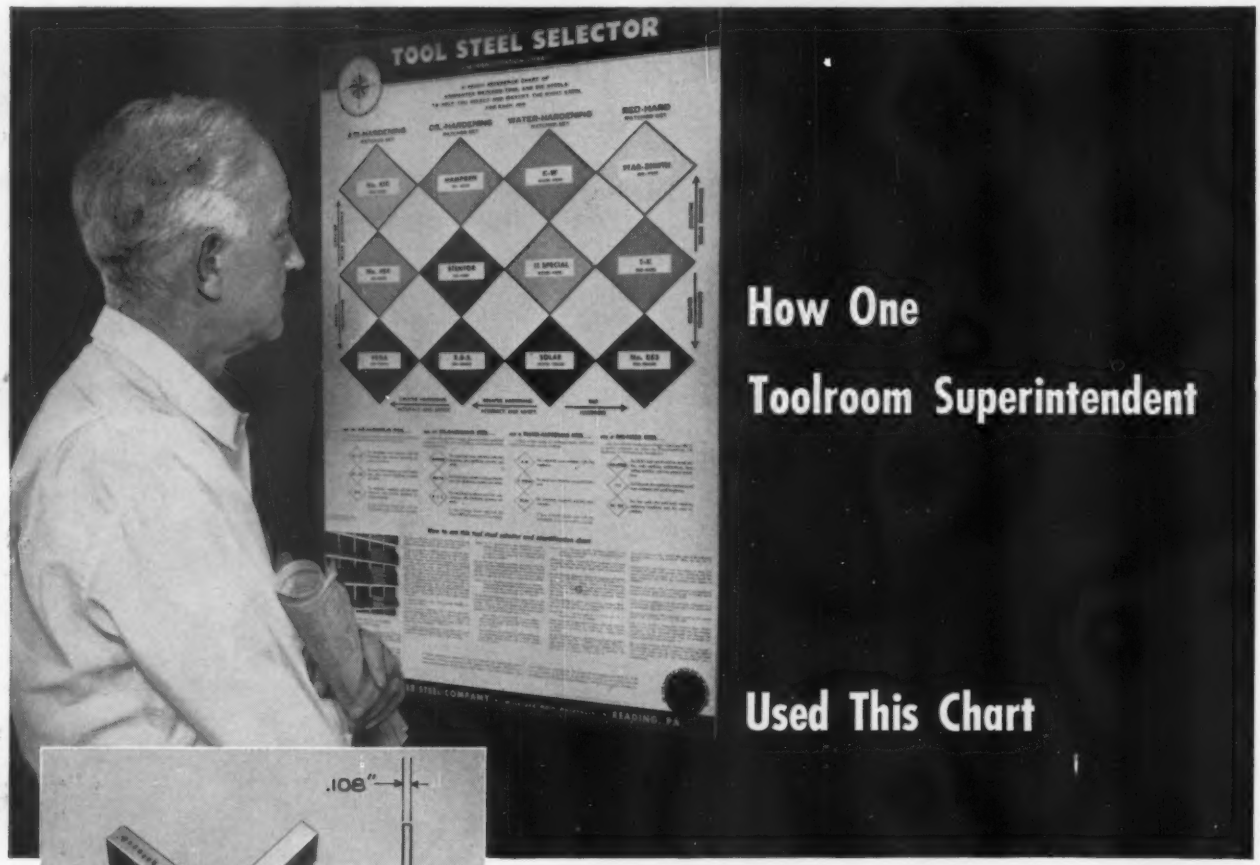
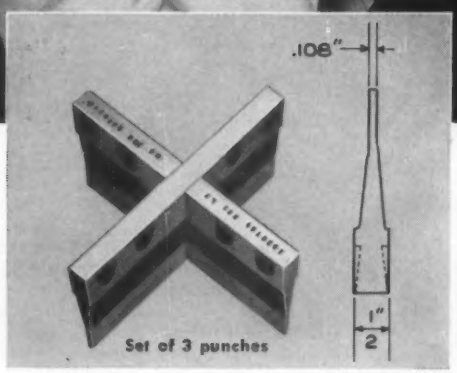
53-32





Job: A set of three special punches used on a high speed machine to close the joints on prefabricated metal window frames made from ⅛" thick SAE 1010 steel.

Problem: Many types and grades of tool steels were tried, but all lacked the necessary toughness and hardening safety. Best service life from any before breakage was three days. Because a set of 3 punches cost hundreds of dollars to make, the low production was hiking up operating costs at a prohibitive rate.

Solution: In a final effort to find a steel with enough toughness and safety in hardening, the Toolroom Superintendent turned to Carpenter and the Matched Set Method. Carpenter R.D.S. (Oil-Tough) was indicated.

Results: Now punches stay in service for about three months, and instead of breaking, they wear out in service.

. . . To Hold Down Operating Costs

In working with many men responsible for tools and dies, we've discovered a simple but often overlooked fact: The man who approaches each tool and diemaking job with the idea of . . . *Simplifying* it, *Reducing* heat treating hazards, and *Improving* previous performance . . . is bound to do a better job.

If you or your men have that approach, Carpenter wants to be of help. We like to think of our association with customers as a "partnership" in a mutual effort to get best possible results. And here's what we offer: Practical, *workable* help at *every step* from diemaking, to heat treating, through on-the-job performance.

And that's why it works . . . both of us have a common goal. Just one example of hundreds is found in the Field Report shown to the left.

One part of this program is the Carpenter Matched Set Method. It is an accurate blueprint for selecting the *one* die steel ideally suited to give you the results you want. It is all outlined in a convenient, full-color Wall Chart available to you.

And that's only a part of the program . . . a program that involves almost 70 years' experience in the development of new and constantly-improved die steels. We're ready to work for you, now. Simply call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor. THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.

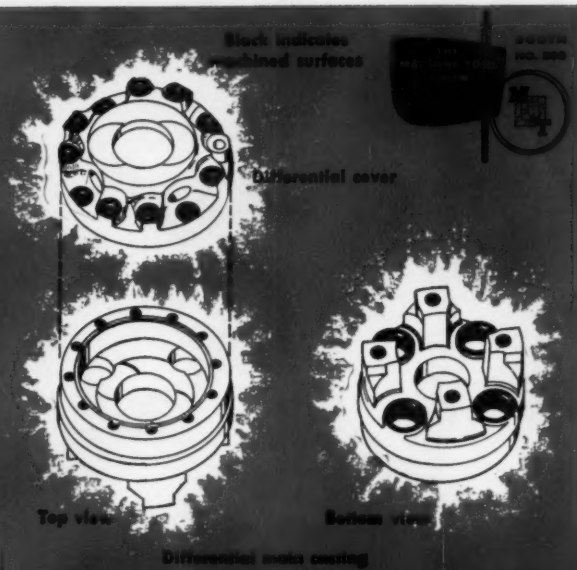
Carpenter STEEL — Matched Tool and Die Steels

IMMEDIATE DELIVERY from local warehouse stocks

Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

CUSTOMER SPECIFIED

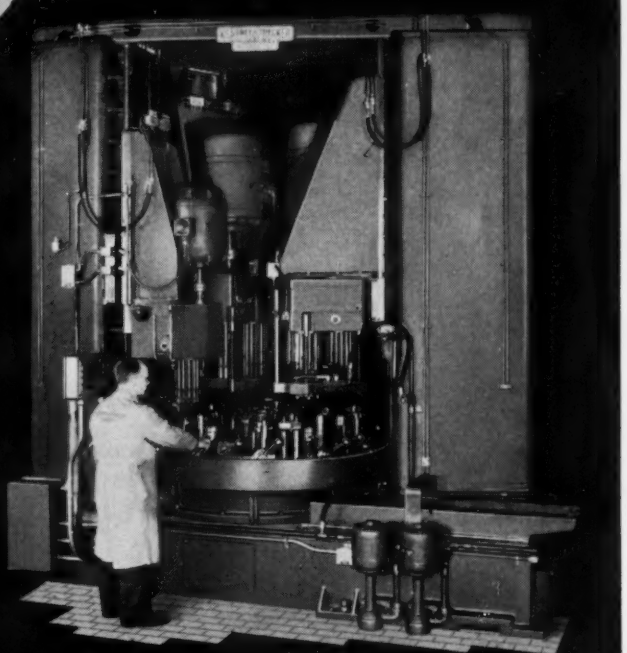
Customer specified a multi-purpose production machine to perform 12 operations in sequence on both the main casting as well as the cover of a differential housing.



KEARNEY & TRECKER DESIGNED

Kearney & Trecker designed this new 88-spindle drilling and tapping machine to complete 134 pieces per hour, 67 covers and 67 main castings.

Machine features rugged columns which provide rigid support . . . and exacting accuracy. Five fixtures, each holding three workpieces, are mounted on a standard Kearney & Trecker 60" rotary index table. Machine employs three vertical drilling heads, each counterweighted. First head has 48 spindles and performs drilling, counterboring, flat bottom drilling and chamfering. Second head carries 28 spindles and handles spotfacing, reaming, boring and trepanning operations while head No. 3 with 12 spindles does tapping operations.



New production efficiency starts with Kearney & Trecker Milwaukee machine tools

This new machine proves that you can rely on Kearney & Trecker's Special Machinery Division to give you the highest production possible at lowest cost. Because with more than 50 years' experience in machine design and manufacture, Kearney & Trecker Corp. has all the ingenuity and skill required to solve high production machining problems.

Why don't you take advantage of our abilities? They can pay off in profits for you. Your Kearney & Trecker Special Machinery Division representative will be pleased to give you all the details. Contact him today!

For more details on the machine illustrated ask for Data Sheet No. 1052. Also, free booklet "Doorway to a proven method for solution of big and small metalworking problems" is yours for the asking.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

Alan Press, Traffic Manager of Screen Gems, Inc., TV subsidiary of Columbia Pictures Corp., tells:

"Why Rin Tin Tin is never late!"

"Every Thursday, kids are waiting for Rin Tin Tin in Miami, Fla., and Bay City, Mich., and fifty-three other cities. They'd be awfully disappointed if he didn't show up.

"How do we get him there? It's simple," says Alan Press. "We ship him on film – by Air Express. We also meet rigid schedules for our other TV network shows: Ford Theater, Captain Midnight and Damon Runyon Theater. All told, over 200 unbreakable dates to meet every week.

"Using Air Express *exclusively,* we've never missed a single show!

"Yet, we save real money with Air Express. It costs $3.78, for instance, on our typical 10-lb. shipment from New York to Bay City. It's the lowest of all – $1.37 less than by the next lowest-priced air service."

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY

FOR 75 YEARS

Manufacturers of modern machine tools

SEVENTY FIFTH ANNIVERSARY
1880 BULLARD 1955

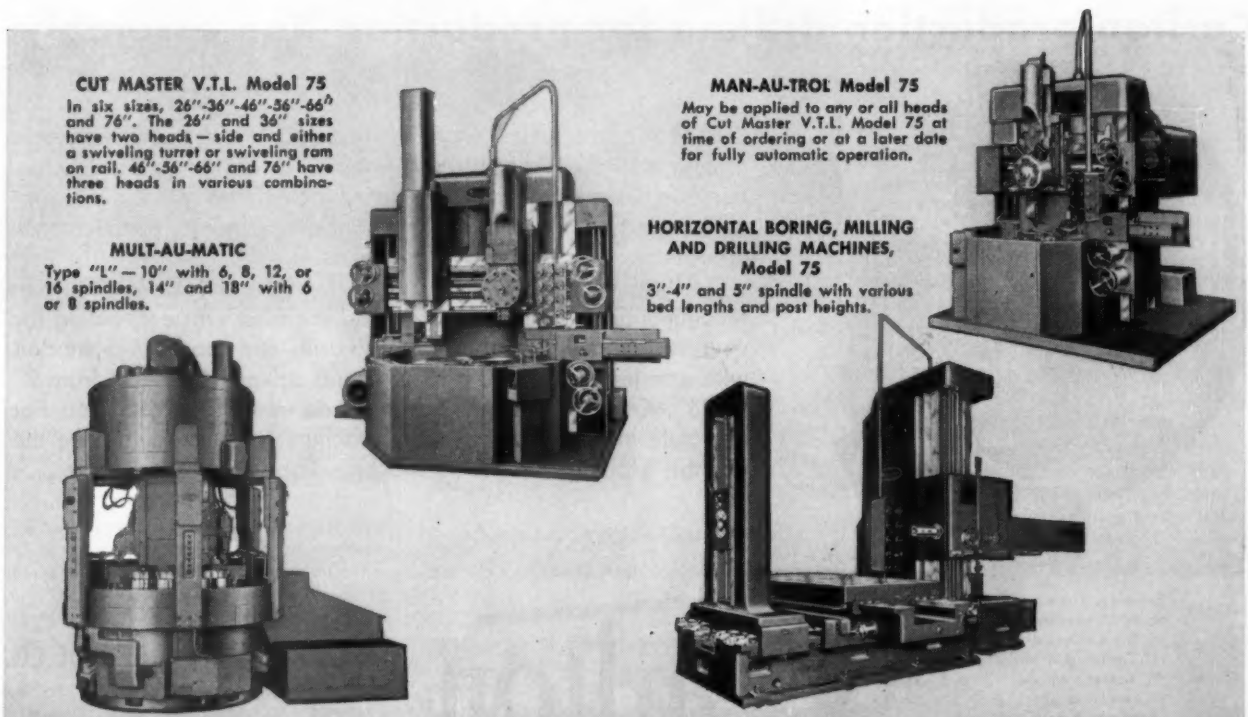
For three-quarters of a century it has been our privilege to serve industry — at home and abroad — with modern machine tools. Today, as in 1880, the name "Bullard" stands for advance design in engineering, quality of craftsmanship and reliable performance.

CUT MASTER V.T.L. Model 75
In six sizes, 26"-36"-46"-56"-66" and 76". The 26" and 36" sizes have two heads — side and either a swiveling turret or swiveling ram on rail. 46"-56"-66" and 76" have three heads in various combinations.

MULT-AU-MATIC
Type "L" — 10" with 6, 8, 12, or 16 spindles, 14" and 18" with 6 or 8 spindles.

MAN-AU-TROL Model 75
May be applied to any or all heads of Cut Master V.T.L. Model 75 at time of ordering or at a later date for fully automatic operation.

HORIZONTAL BORING, MILLING AND DRILLING MACHINES, Model 75
3"-4" and 5" spindle with various bed lengths and post heights.



THE BULLARD COMPANY • BRIDGEPORT 2, CONN.

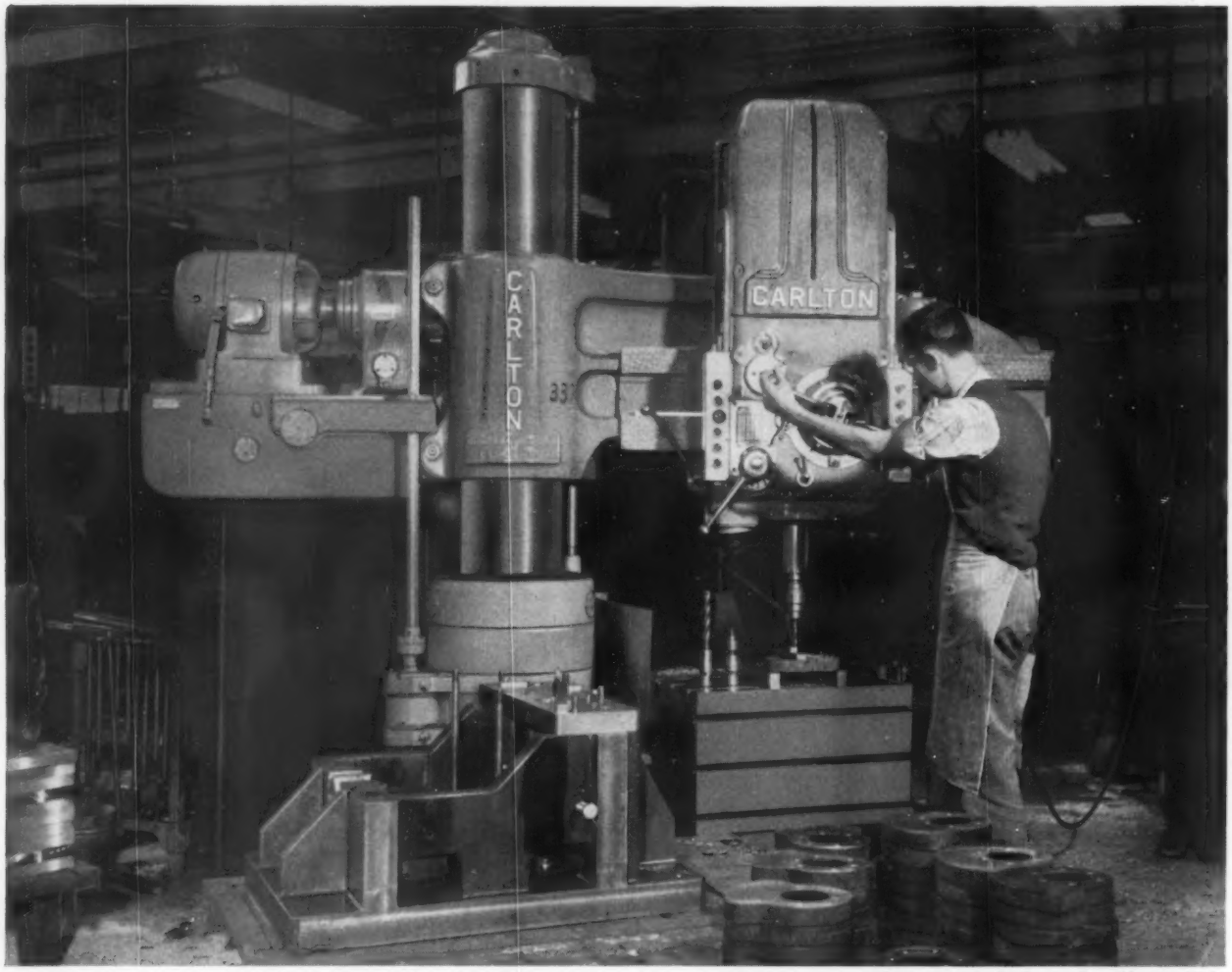
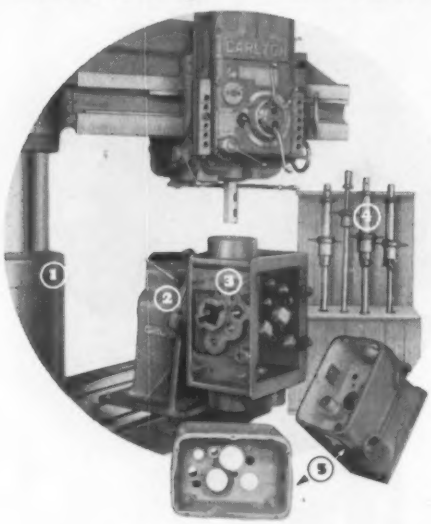


photo courtesy the Besser Co., Alpena, Mich.

Carlton production drilling for production line assembly



Running time reduced from 7 hours on previous method to 5.25 on this Carlton engineered set-up:
(1) Carlton 3-A radial drill
(2) master trunnion
(3) revolving jig
(4) boring bars
(5) transmission body casting
25% savings effected by eliminating horizontal operation.

Carlton radial drills, properly tooled, give you production hole drilling with the precision performance so necessary for production line assembly. Parts come out of the drill jig with the uniformity that permits interchangeability of parts, eliminates unnecessary operations, makes substantial savings.

Carlton engineers will be glad to work with your engineers in recommending the best Carlton and the most efficient tooling for your requirements. Carlton radial drills are made in 5 models with arm lengths from 3-ft to 12-ft and column diameters from 9" to 26". Carlton horizontal drills made in 4H and 5H sizes. For complete information, call your machine tool distributor, see the Carlton brochure in Sweets Machine Tool Catalog, or write . . .

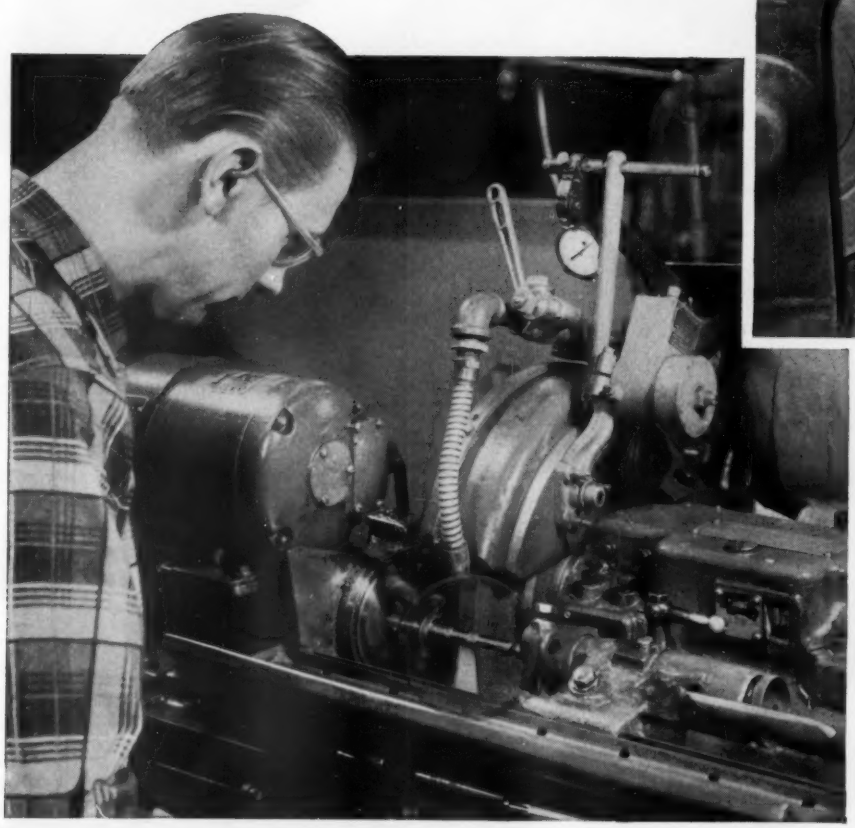
Carlton

THE CARLTON MACHINE TOOL CO.
CINCINNATI 25, OHIO

HORIZONTAL AND RADIAL DRILLS

Norton G Bond wheels set new economy records in O.D. grinding

Users tell how "TOUCH of GOLD" performance boosts production rate, product quality and profits



"Production rate increased almost 50% with G Bond wheels, and both wheel life and diamond life have doubled," are typical "Touch of Gold" advantages reported by this cylindrical grinding customer. Job is grinding chrome plated gages ¼" to 2" O. D. The material removed is .002" to .003", and the finish is 4 to 8 microinches. Previous wheels required dressing every hour — G Bond wheels are dressed every 8 hours.

"We cut grinding time by two-thirds with G Bond wheels. Also, the G Bond wheels cut cooler, produce a much better finish, and give us 23 parts per dressing compared to the 10 we used to get." That's the report on this centerless grinding job. The work is aircraft slip joint sleeves of 321 stainless steel, chrome plated, 3½" diameter x 7" long and .060" wall. Stock removal is .010" to .015", at .005" per pass.

Users all over the country report that Norton G Bond wheels have given them an entirely new slant on the profit-possibilities of their centerless and cylindrical grinding jobs.

The two examples pictured here are typical of the very many enthusiastic endorsements that are pouring in. And you could sum them all up in this sentence: "G Bond wheels grind faster, finish better, last longer and save us money on every job."

The Norton G Bond is by far the most efficient vitrified bond ever developed for precision and semi-precision grinding. Wheels made with it outperform all others, with "Touch of Gold" advantages like these:

Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per dressing . . . longer wheel life . . . easier dressing, with less wear on diamond or on crushing roll.

See your Norton distributor

for proof of how G Bond wheels can help improve your products and cut your production costs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products . . . to make your products better

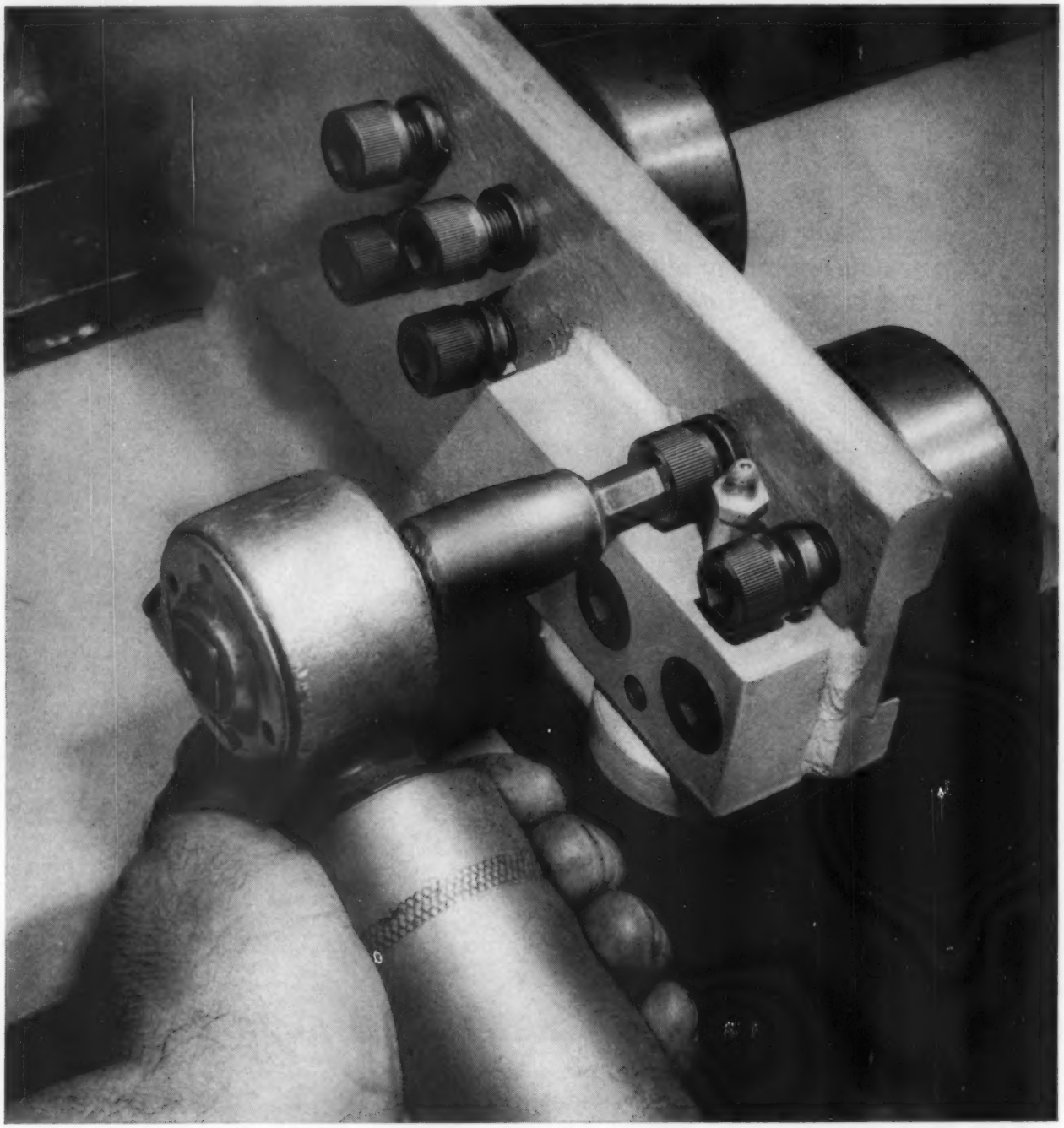
W-1608

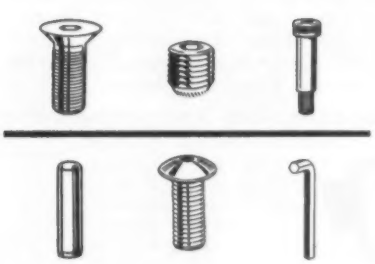
NORTON

and its **BEHR-MANNING** *division*

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

UNBRAKO AT WORK



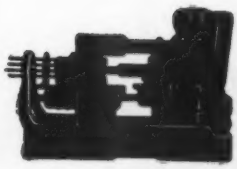


UNBRAKO SOCKET HEAD CAP SCREWS provide additional safety and increased efficiency on industrial lift trucks. Sixteen of them are used to fasten the side thrust fork carriage rollers which reduce the stresses caused by off-center loading. These standard UNBRAKOs have heads forged for strength, and sockets of uniform depth and size for strength and maximum torque in wrenching. Fillets and threads are formed to provide continuous grain flow throughout the screw. For the UNBRAKO story, see your authorized industrial distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

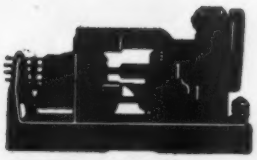
UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

with the addition of

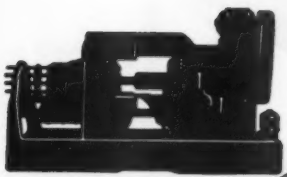
4 New Models



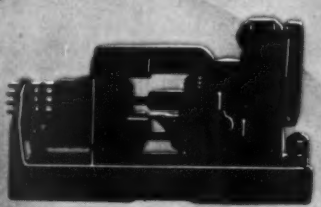
NEW 5/8" RA-8



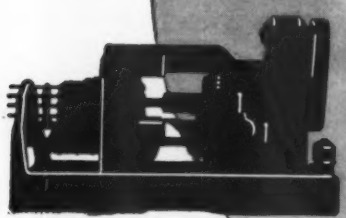
NEW 1¼" RB-8



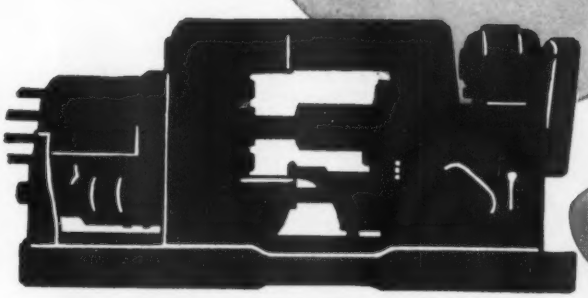
1⅝" RB-8



2⅝" RB-8



NEW 3½" RB-8



NEW 4" RB-8

Acme-Gridley 8-spindle advantages now extend to ALL ranges of bar work up to 4" diameters

The principal performance advantages of Acme-Gridley 8-spindle bar automatics now can profitably be applied to bar work as small as the capacity range of a ⅝" machine and as large as 4" diameter. These advantages include:

- faster machining cycle time because of additional end working positions;
- "new machine" reliability longer—with carbide or high speed tooling;
- greater accuracy and uniformity of parts with fewer rejects;
- completion of a greater number of secondary operations in the primary machine setup (spindle stopping mechanism optional), with consequent savings in man hours, floor space and machine investment.

And for help-when-you-need-it, these new models (and all Acme-Gridleys) are backed up by a wealth of "*complete line*" tooling experience (literally thousands of tooling setups) plus a policy for service which has always played a mighty prominent part in maintaining National Acme's position of leadership.

It will pay you to plan your production the modern Acme-Gridley 8-spindle way. Why not ask us to tell you more about it?

SEE US AT THE MACHINE TOOL SHOW • SEPTEMBER 6 TO 17 • BOOTH NUMBERS 324 AND 706

OUR JOB: to provide the *Right Machine* for YOUR JOB

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

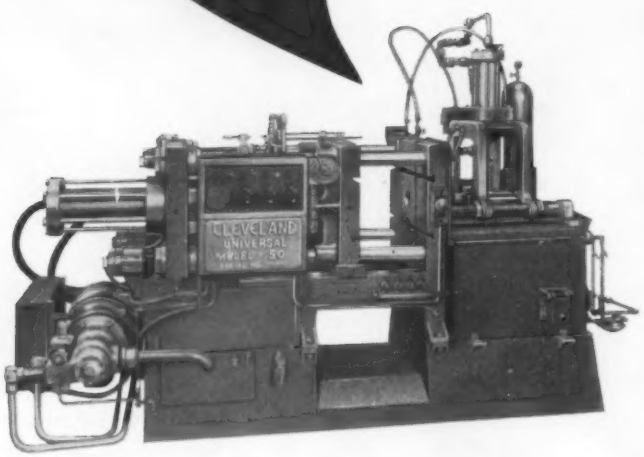
THE NATIONAL ACME COMPANY

171 EAST 131st STREET • CLEVELAND 8, OHIO

for small die castings . . .

you'll get profitable production from this fast, efficient, low cost

CLEVELAND
Model 50



Cleveland Model 50 Universal Hydraulic Die Casting Machine. Converts from zinc, tin or lead casting to aluminum, brass or magnesium casting by simply changing the hot-metal shot end. Size of die plates: 18¾" x 22". 50-tons locking pressure. Similar in construction to machine shown above is the Cleveland Model 100 Die Casting Machine which has 22½" x 24½" die plates, 100-tons locking pressure.

Write for Bulletin 50

For small die cast parts, you can depend upon the Cleveland Model 50 Universal Hydraulic Die Casting Machine to give you *profitable* production — on high volume runs or short runs where the die investment can be low.

Very economically priced, the Cleveland Model 50 is designed and engineered to provide every essential to insure precision-quality castings at a high rate of speed. The Model 50 will free cycle at over 1000 times per hour. Tie bars, toggle links, pins, platens are of extra-heavy, rigid construction. Automatic electric timing of the cycle is a part of the standard control system. Hydraulic controls are provided for core pulls. High injection speed and pressures assure sound, dense, *"hardware"* finish castings.

Detailed information on these and many other Cleveland-quality features is given in Bulletin No. 50, which also describes the next size larger, Model 100, Cleveland Die Casting Machine. Write for your copy today. Better still, arrange now to discuss your die casting machine requirements with the Cleveland Automatic Sales Engineer in your area. There is no obligation.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

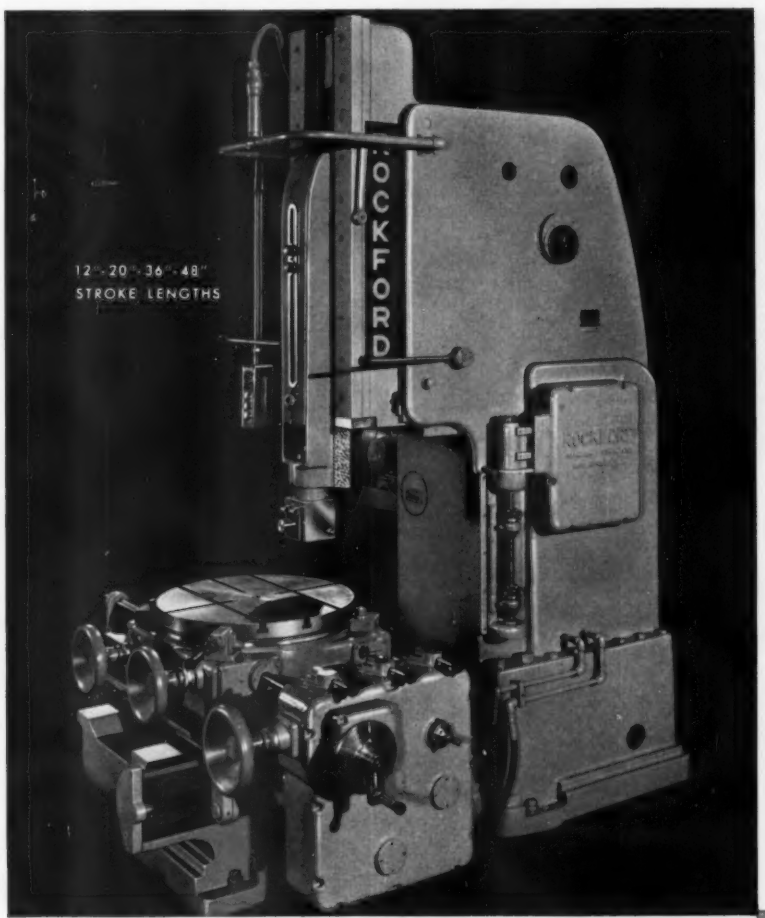
HYDRAULIC

fast, economical production calls for

HYDRAULIC

hydraulic slotters

HYDRAULIC



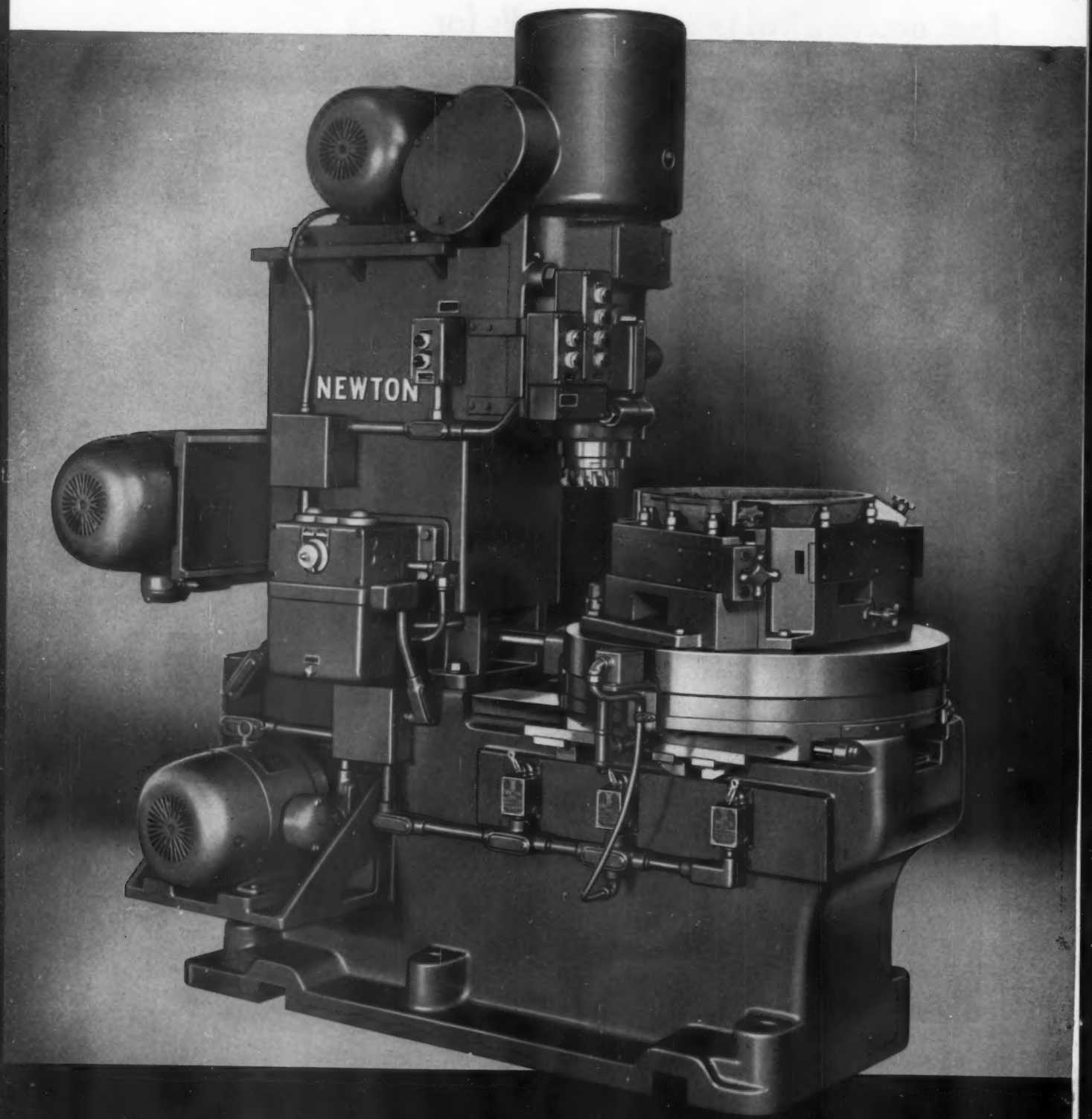
Hydraulic Drive is a natural for reciprocating-type machine tools. It provides smooth, powerful cutting, fewer moving parts, and longer useful life.

Hydraulic Slotters have power feeds and rapid traverse in all directions, and they may be equipped with Kopy-Kat Duplicators for fast, accurate duplicate-machining. When you modernize your production facilities plan on Hydraulic Shapers, Planers and Slotters to provide the fastest, most economical production methods.

ROCKFORD MACHINE TOOL CO.
2500 Kishwaukee Street • Rockford, Illinois

Hy-Draulic

For Milling the flanges

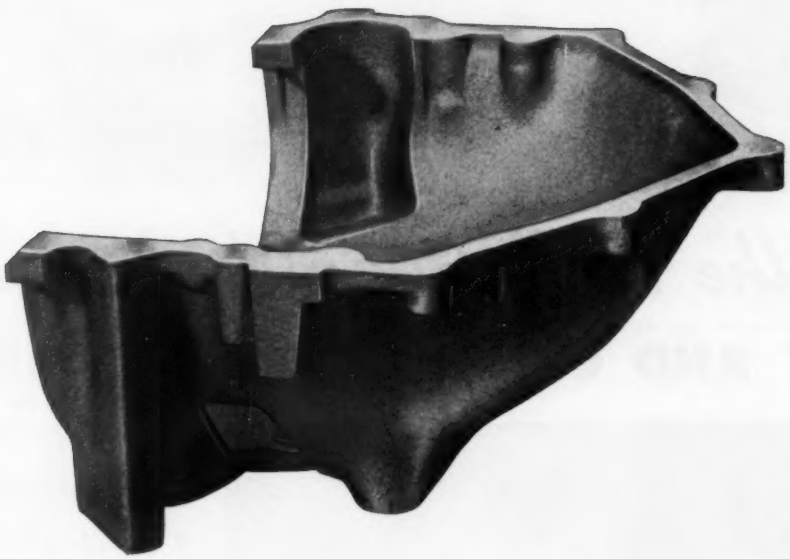


CONSOLIDATED MACHINE TOOL

A Division of Farrel-

of thin Castings...

Newton Vertical Rotaries



- **You *can't* mill the flange on this flywheel housing like you would a cylinder block. It's too thin for big diameter cutters.**
- **But you *can* mill it with a small diameter cutter on a Newton Vertical Rotary and *mill it fast!* All the operator does is load, push a button and unload. A 100 per cent automatic feed and traverse cycle does the rest.**
- **Of course, it is the *circular feeding of the table* that turns the trick and allows you to use small diameter cutters on this kind of work.**

COMPANY, ROCHESTER 10, N. Y.

Birmingham Company, Incorporated

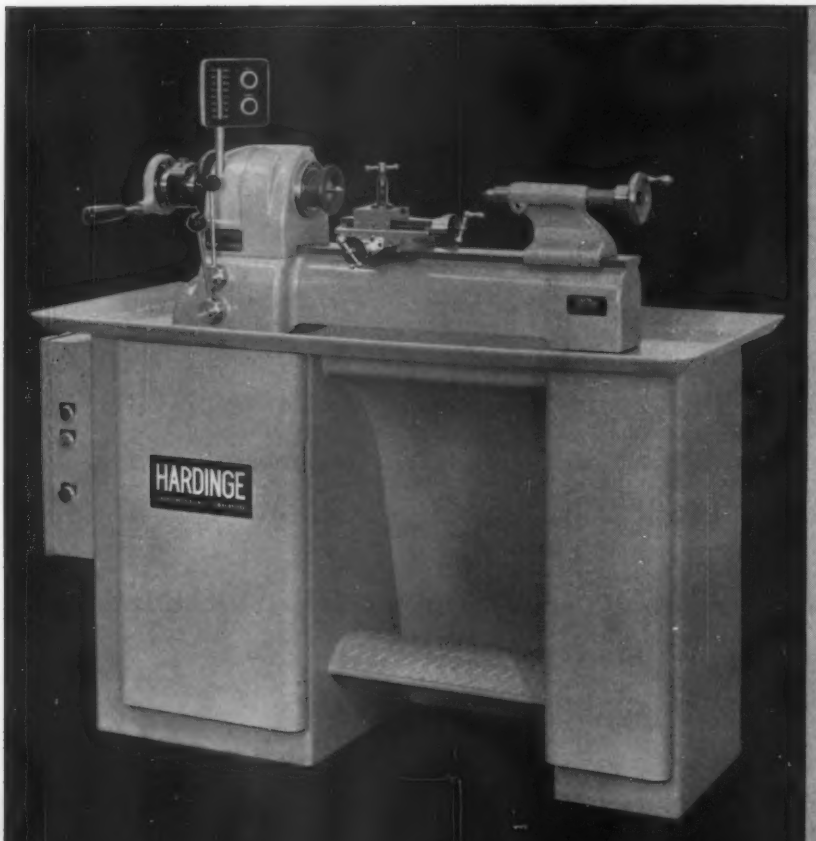
HARDINGE
ELMIRA, N.Y.

NEW Lathe with Variable Speed for Tool Room—Development—Production Work

Simply Push a Button for Exact Spindle Speeds

It's the NEW Simplified Design

EASY AND CONVENIENT TO OPERATE



FEATURING:

- Infinitely Variable Speeds 230 to 3500 r.p.m.
- Fast Lever Operated Collet with 1 1/16" Capacity
- Hardened and Ground Steel Dovetail Bed Ways
- Patented Positive Lock Slide Rest
- Full Bearing Tailstock
- And Other Cost Cutting Features

For Complete Information on this Precision Lathe Write for Bulletin DV59

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

You can spot productive hands by the company they keep!

Boost contour polishing with Behr-Manning abrasive belts!

WITH THESE MODERN COATED ABRASIVE applications on hand, you can produce superior finishes on tricky contours at record breaking speeds. The combination of flexible, even-cutting BEHR-MANNING abrasive belts and up-to-date methods make this possible. Test them on your parts — in your plant or in a nearby BEHR-MANNING Demonstration Room.

Write for the Production Digest Bulletin. Contains 60 pages of detailed data on coated abrasive grinding and polishing techniques. Address Behr-Manning, Troy, N. Y., Dept. AM-4.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

Model CN-2 made by Engelberg-Huller Co., Syracuse, N. Y.

A favorite for dry fining and blending plumbing parts.

Smoothing the way to finer finishes on flat areas.

Tops for removing flash from difficult inside contours.

G-4

BEHR-MANNING® *division of NORTON Company*

▲ COATED ABRASIVES ▲ SHARPENING STONES ▲ PRESSURE-SENSITIVE TAPES

WELD GRINDING DISC-WHEELS

BAY STATE ®

WHEELS of PROGRESS

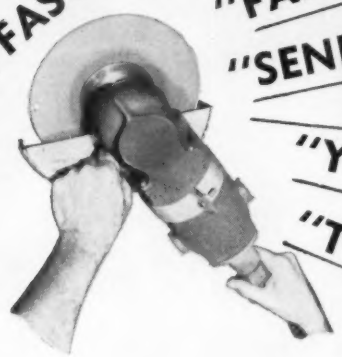
Use On:

Mild Steel
Hard Steel
Stainless Steel
Aluminum

For:

Weld Grinding
Blending
Cut-Off

"FASTEST CUTTING EVER"
"PRODUCTION UP 3 TIMES"
"FAR SUPERIOR TO OTHER DISCS"
"SEND US 150 MORE . . . IMMEDIATELY"
"WONDERFUL ON STAINLESS WELDS"
"YOU'VE REALLY GOT A PRODUCT"
"TERRIFIC ON ALUMINUM"



FROM field tests come these and hundreds of other enthusiastic customer reports about "BF" . . . the new Reinforced Resinoid disc-wheels that are a sensation in the weld grinding field.

These BAY STATE "BF" discs are sharper, do cut faster, remove more stock, and last longer, too! . . . but you'll have to see them in action to believe it.

Order trial wheels, or ask for an actual demonstration now.

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Massachusetts, U.S.A.

Branch Offices and Warehouses—Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa. Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE
WHEELS of PROGRESS

MAIL TO YOUR LOCAL DISTRIBUTOR OR TO WESTBORO, MASS.

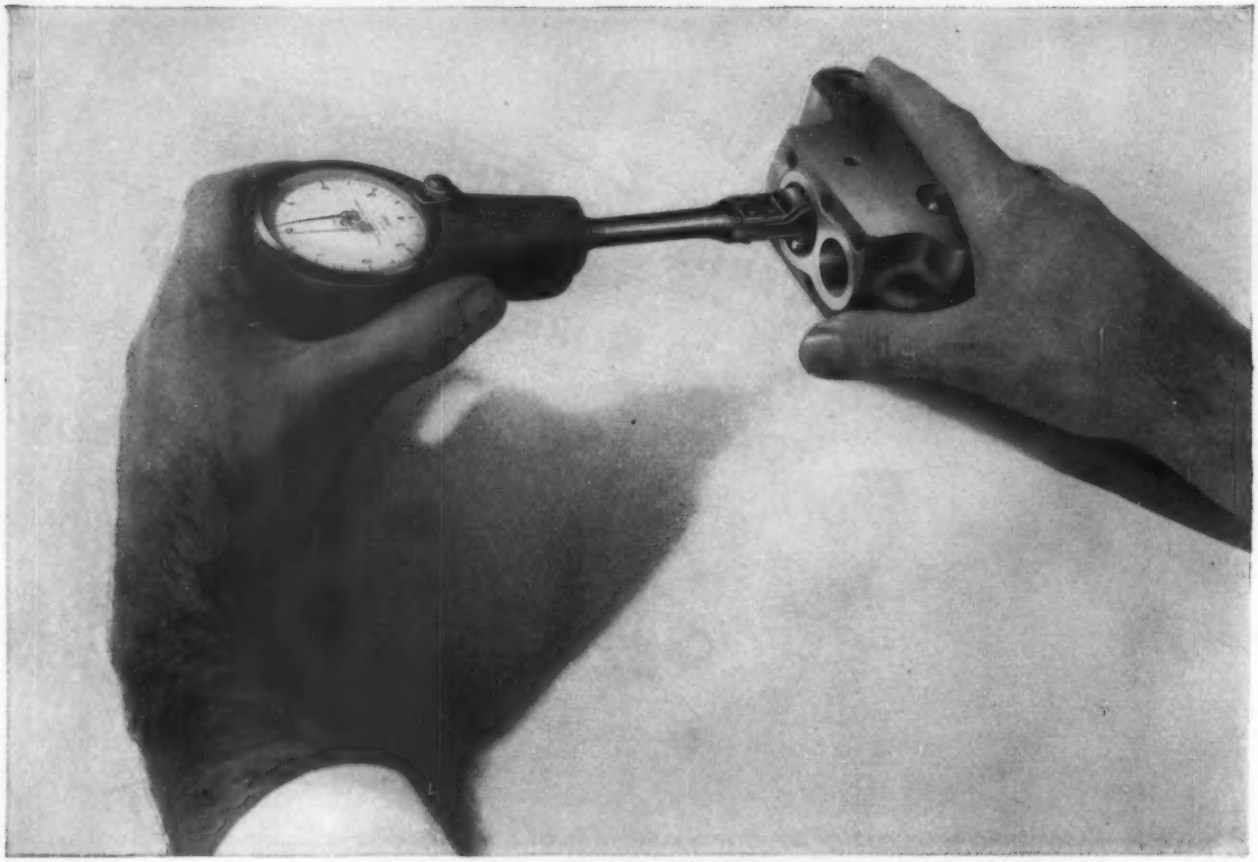
Please arrange a demonstration of your new "BF" Disc Wheels

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____



Just How Accurate Must A Gage Be To Be Accurate?

Precision is relative. A specified dimension of 1.625" is never exactly 1.625" on the workpiece. That's why you use tolerances.

You use gages to find out how closely your work comes to the specification 1.625". But, gages themselves can also vary in their accuracy. So *they* need tolerances, too.

And that is what we want to talk about. We put tolerances on the accuracy of the gages we make. We make them to an accuracy standard that experience indicates is "high grade" and acceptable to those who have a "high grade" regard for the dimensional quality of their products. We also build into them a durability that makes sure that our gages will maintain that accuracy standard for a long, long time.

For instance, some gage users would specify steel contacts on a gage like that shown above. We *can* supply steel contacts but *our* standard of accuracy calls for contacts of the hardest material — diamond. Why? Because the minute you start to use a gage the contacts begin to wear. You may have saved a few dollars on the soft contacts but soon the gage begins to change its accuracy. You have to check it oftener and reset it. If you forget, you are soon passing out-of-tolerance work. Another example: The above gage could be made to centralize itself positively, but it would not gage as accurately.

These are only two illustrations. We know that accurate gages require certain basic fundamentals in their design. — Moreover, they should not be "multi-purpose" or Rube Goldberg gages difficult to adjust and of doubtful accuracy.

We *know* these things are true. That's why Federal insists on adherence to *proven* principles of gage design.

Ask our Engineers for recommendations to meet your gaging requirements.

FEDERAL PRODUCTS CORPORATION

5124 Eddy Street, Providence 1, R. I.

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

Wide range of models

NEW BRITAIN +GF+
COPY TURNING MACHINE

Changed over in minutes, using simple template, or prototype.

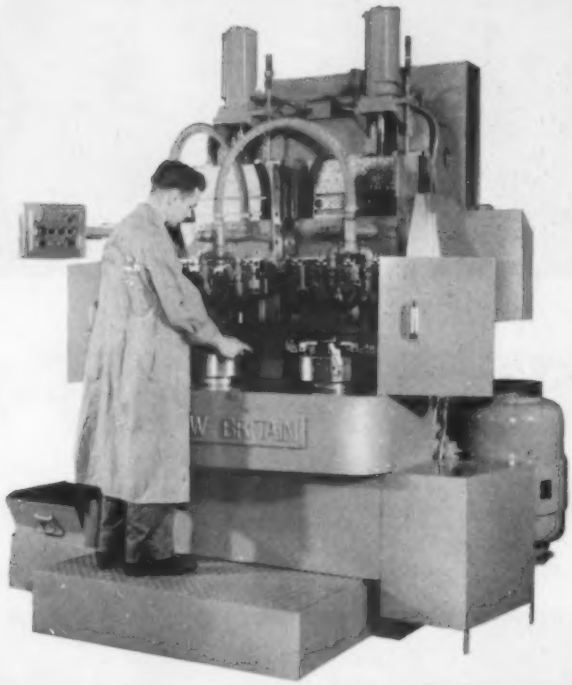
Created specifically for profitable copy turning and boring. Ask your New Britain representative for a showing of the color motion picture "A NEW APPROACH TO COPY TURNING" in your own plant. Or write The New Britain Machine Co., New Britain, Conn.

Economical for short or production runs.

See the following four pages for other New Britain New's.

New Approach to Precision Boring

It's cam actuated • It's vertical • It's New Britain

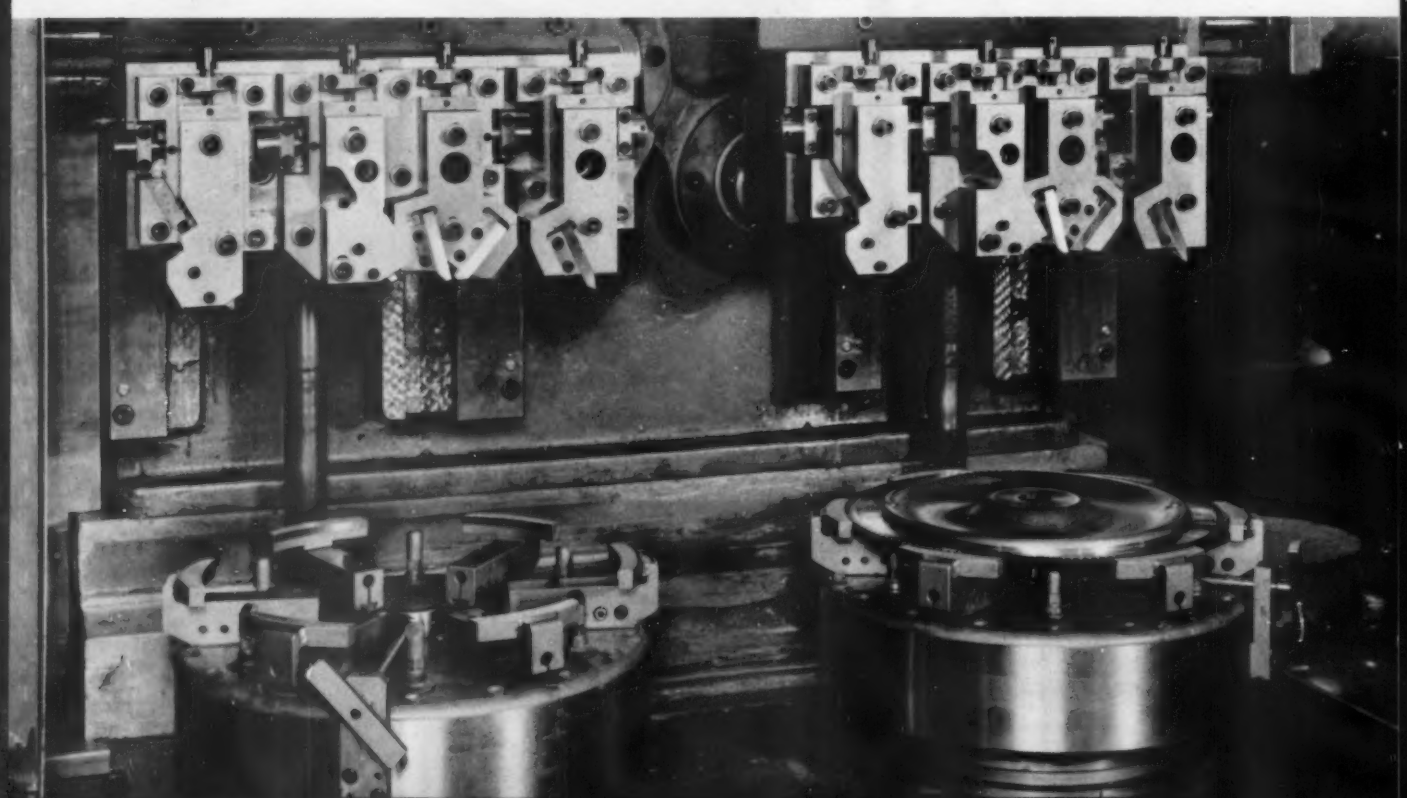


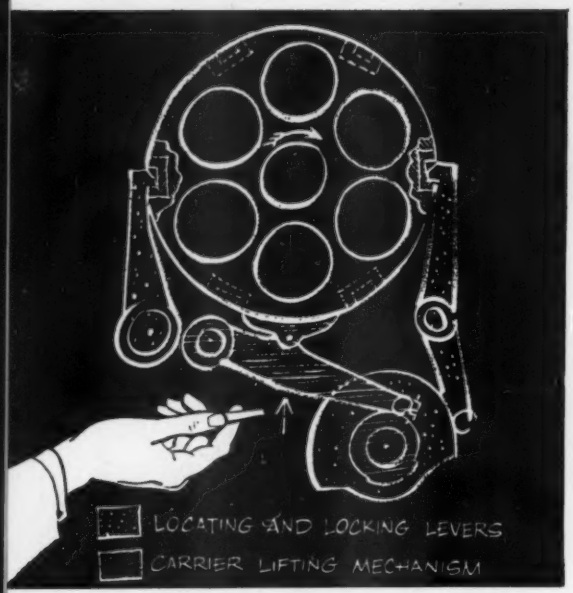
It extends the speed, accuracy and fine finish of precision straight and contour boring and turning to an even wider range of work.

New Britain's new vertical models feature accurate control of tool paths and cycle timing. This is the basic approach to precision boring employed in New Britain's famous single and double-end boring machines.

Shown below: a close-up of the tooling area of the Model 210 New Britain Vertical Precision Boring Machine at the top of the page.

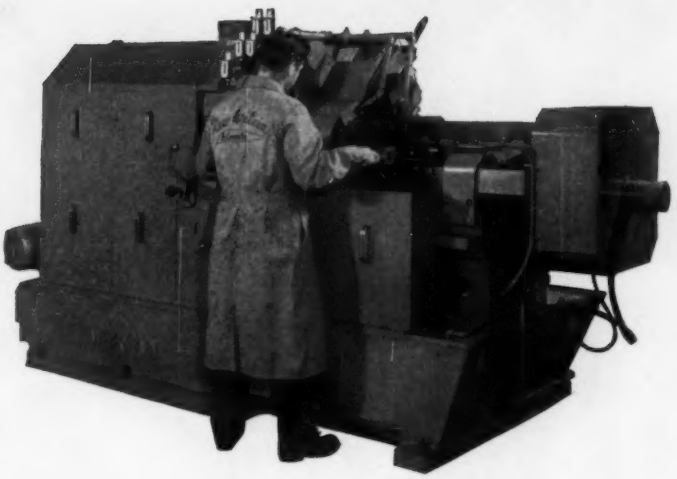
Two pieces are machined simultaneously by duplicate sets of tools. Left hand piece has been removed to show construction of chuck.





Even slight wear on the spindle carrier or its locating pads would destroy accurate alignment of end-working tools with center line of the spindle. Blackboard sketch shows how carrier is lifted during index, positively located and locked during cutting cycle.

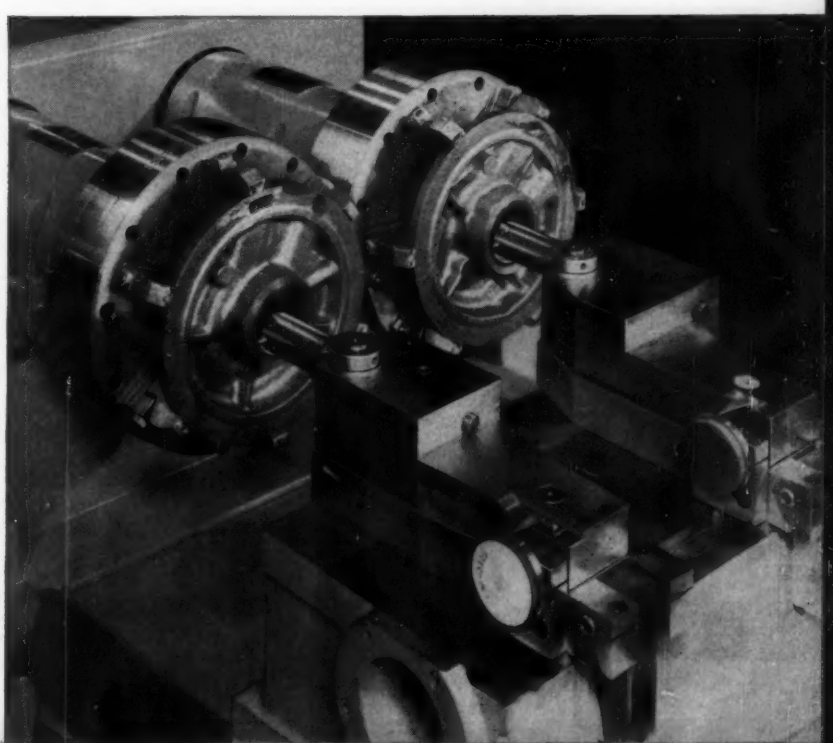
Billions of indexes with absolutely no wear!



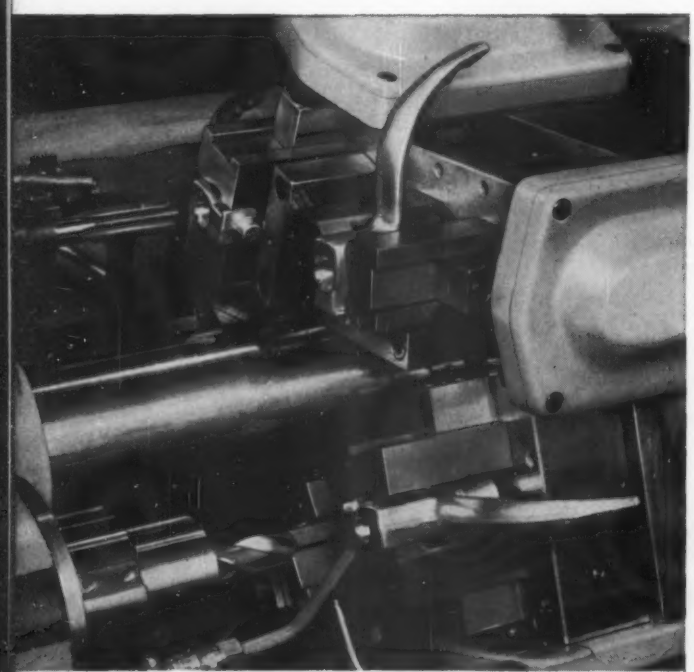
Experienced shop men say: *New Britain Chuckers stay on the job and stay accurate*. That sums up the profitable end results of exclusive features like the one described at the left.

The secret of precision boring is constant close control of the tool

Successful precision boring and turning calls for control of tool paths and cycle timing, both with "gage makers' " accuracy. Precision ground cams insure this accuracy under all conditions on a New Britain. This hairline control, combined with ruggedness and stamina for *permanent* accuracy, produces fine finishes piece after piece, year in and year out.



New New Britain Chucker will produce pieces as fast as operator can load them.

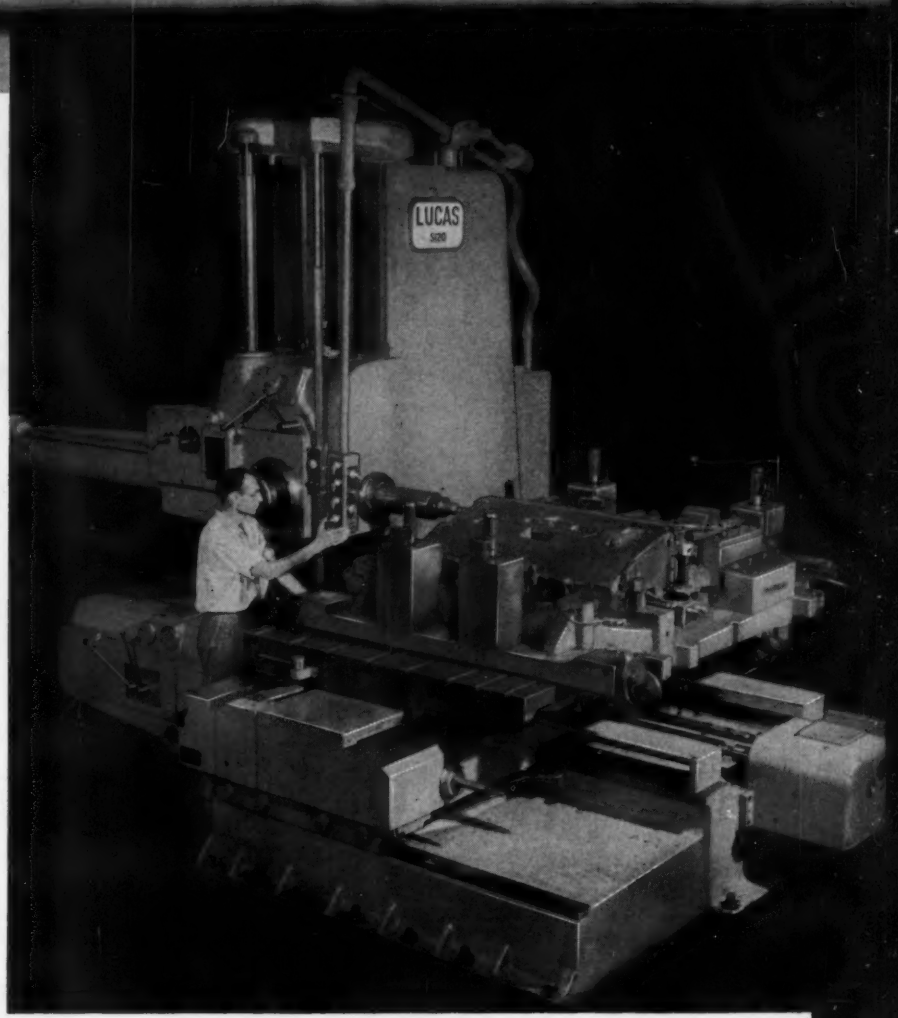


Irregularly shaped pieces — parts difficult to swing on a work-rotating chucker — pieces hard to produce at a profit, belong on the New Britain Model 23B.

This four-spindle chucker can machine up to 1290 pieces per hour (that's one every three seconds). A fifth, easily-operated, quick-acting chuck in the loading position minimizes idle time and operator fatigue.

If you produce pieces that lend themselves to a tool rotating machine, New Britain Model 23B could become one of the most valuable machines in your shop. Check with the New Britain man or write for Catalog on Model 23B.

LUCAS OF CLEVELAND

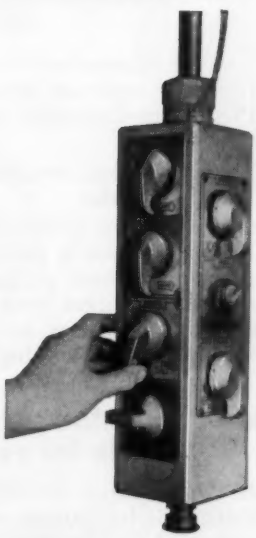


Model 6120S Lucas Precision Horizontal Boring Machine built for a large stamping plant, is used for reconditioning, altering and originating large die sections.

This short bed space-saving machine incorporates all the features of standard machines except a backrest for bar support. The 120" wide bed is of one piece construction for rigid table and saddle support.

This machine is ideally suited to heavy die work which combines operations of boring, drilling and milling in both high and low speeds.

This Lucas will be YEARS AHEAD for a long time



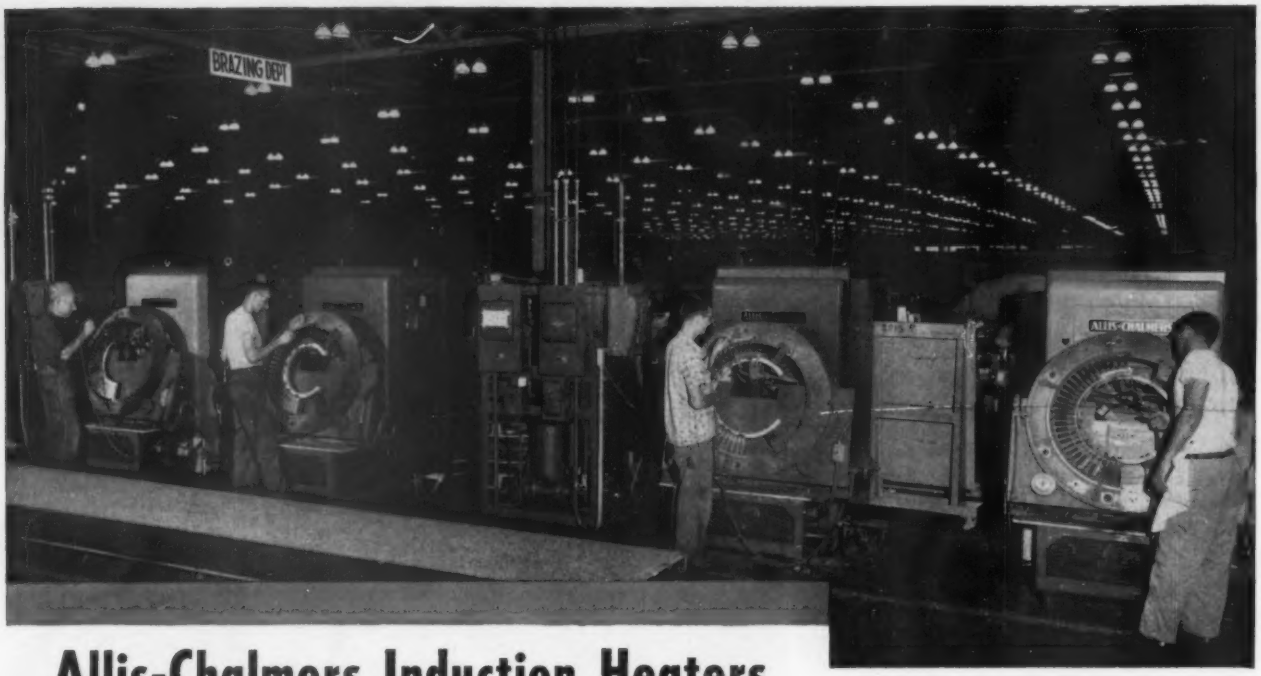
Because Lucas applies its engineering skill to boring machines exclusively — because so many of the important improvements have originated at Lucas — because every new development is incorporated in the next lot built, *you get the latest first when you buy a Lucas.*

For example: Lucas, one of the first to develop pendant controls on the Horizontal Boring Machine, now offers a new, compact, lightweight control pendant with smooth operating multi-purpose directional switch levers. Or take Lucas Automatic Power Positioning, with built-in, pre-set positioning feed which positively repeats a series of operations without the use of jigs and fixtures. Read more about these features and many other points of Lucas leadership — write for the complete story in detail. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

• AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
• LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES • NEW BRITAIN +GF+ COPYING LATHES

The NEW BRITAIN MACHINE COMPANY

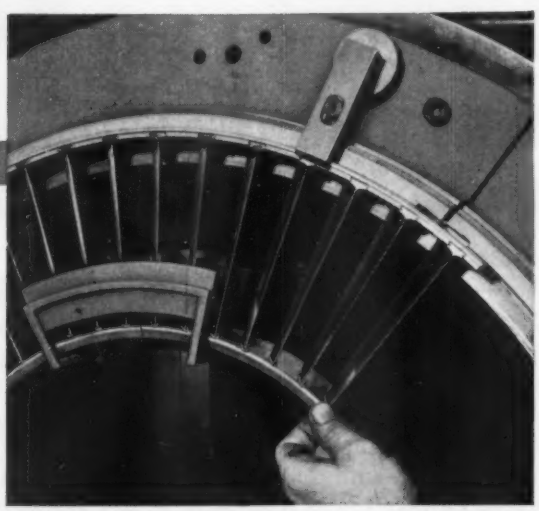
New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio



Allis-Chalmers Induction Heaters

Cut Brazing Time 50%

and Increase Uniformity



The brazing alloy, in wire form, is clip shaped. Photo shows how clip is slipped over one edge of the blade. As alloy heats, at temperatures from 1350 to 1400 F, it flows around the entire base of the blade.

Here's what happened when a turbojet engine manufacturer replaced hand brazing methods with eight Allis-Chalmers Electronic Induction Heaters.

The work involved brazing shrouds to the tips of compressor blades.

Today, using the Induction Heaters and special fixtures, the job is performed in a continuous operation without pulsation or reheating of components. It takes only half the time formerly required. Brazes are more uniform and the average pull test loading is 33% above minimum of 2800 pounds.

Here's what Induction Heating can do for you...

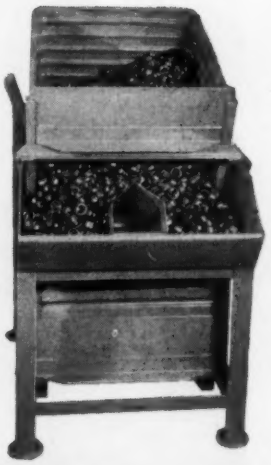
If your work involves brazing, soldering, annealing, heating or hardening — it will pay you to know about Allis-Chalmers Induction Heaters. In practically every installation they have resulted in substantial increases in production or product preference, and healthy cuts in material costs and rejects. See your nearby district office or write for details. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4578

ALLIS-CHALMERS

AT LAST! Really Automatic Materials Handling...

IMPROVED PRODUCTION OF MACHINE OPERATORS
INITIAL INSTALLATIONS SHOW
SENSATIONAL SAVINGS
IN HANDLING TIME—



Work receiving box in same stand conserves floor area.

Big hopper holds work supply during box changing.

Here's materials handling history FLOW-MATION* by Powell—the greatest innovation in materials handling in a decade.
Your standard lift truck—no special attachments needed—sets a FLOW-MATIC* box on a special rack. The box opens under its own weight, discharging contents into work level hopper. Operator drops finished piece through chute into hopper to second box below. It's as simple as that.

Those who have seen it in action agree—there's nothing like it for cutting production time, reducing handling hours, lowering operator fatigue, conserving floor space—for saving you time and dollars. But get the entire story. See your Powell representative. He has full literature and working models. Or write direct to Powell for your copy of Powell FLOW-MATION* Systems, a specially prepared pamphlet that explains the entire system.

*FLOW-MATION and FLOW-MATIC are trade names of Powell Pressed Steel Co.—Product Patent Pending.

POWELL
PRESSED STEEL
Since 1920

Get Your Free Copy

Mail Coupon Today

flow-mation* Systems

the POWELL PRESSED STEEL Co., Dept. 945 HUBBARD, OHIO

I would like a copy of FLOW-MATION*, the illustrated pamphlet that gives full details of the new Powell FLOW-MATION* System.

Name.....

Title..... Company.....

Address.....

Joe Vuille says it's simple arithmetic:
"180 cups per min. x 60 min. x 40 hours per week x 5 weeks=

2,160,000 brass cups in one uninterrupted run"

From the cup illustrated actual size above, socket shells are produced in eight operations on special equipment, followed by a stress-relief anneal and a final bright-dip.

Socket shell caps like this are formed in an 8-operation multiple-plunger press at the rate of 86 per minute.

Typical of Leviton's complete line of lampholders is this "Electrolier Push Thru" model. Both shell and cap are made of ANACONDA Brass.

For more than 20 years, Joe has been pressroom foreman of Leviton Manufacturing Company, Brooklyn, N. Y., one of the world's largest manufacturers of electrical wiring devices.

Multi-million production runs of stamped and drawn products are nothing new to Joe, but he'll admit that there's more to it than a multiplication table:

"First," says Joe, "you start with a good product design. Then the toolroom calls on its broad experience in diemaking. Next, good equipment and good housekeeping are essential in the pressroom. And then there's the brass: these extra-large coils of brass strip have to be just so . . . in dimension, composition, grain size, temper and surface finish . . . lot after lot after lot . . . tailor-made for the job."

Each year Leviton uses more than a million pounds of ANACONDA Brass, produced to Leviton's precise specifications, "just so . . . lot after lot after lot . . . tailor-made for the job." Perhaps we can perform a similar service for you? Write to *The American Brass Company, General Offices, Waterbury 20, Connecticut.* In Canada: *Anaconda American Brass Ltd., New Toronto, Ontario.*

8579

You can always depend on

ANACONDA®

copper, brass and bronze

Mail Coupon Today

Address.....

Tips from Taft-Peirce

on how to...

Grind to .0001″

Hard to believe but true. This Taft-Peirce No. 1 Surface Grinder, with verniers, produces surfaces of an accuracy, flatness, and finish formerly considered difficult or impossible to achieve. Experienced operators frequently can grind to .00005″, with surfaces so smooth, in many cases, they seal without lapping.

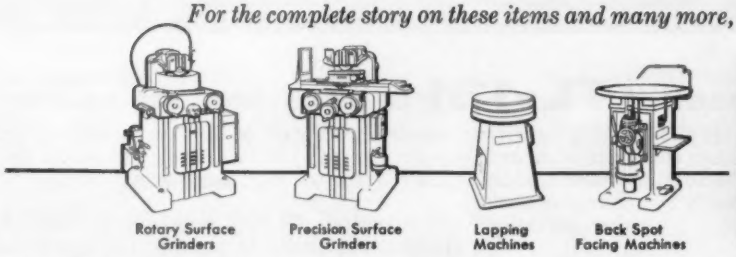
Lower Lapping Costs

A T-P 24″ Rotary Lapping Machine offers a fast, accurate way to obtain superfine finishes and true contact surfaces. Low in original cost, economical to operate, it has the speed and capacity for rapid processing in small lot manufacture or tool room work. Available with plain plate for cylindrical work, grooved plate for flat work.

Reduce Grinding Time

Developed for our own shop, T-P 6″ Rotary Grinders make fussy precision work easier and faster than ever before. Tilting Wheelhead tips 30 degrees below center . . . locks accurately in any position. Superpower magnetic chuck turns through 15 degree angle. Vernier feed permits .0001″ vertical settings.

For the complete story on these items and many more, send for your copy of the Taft-Peirce Handbook.

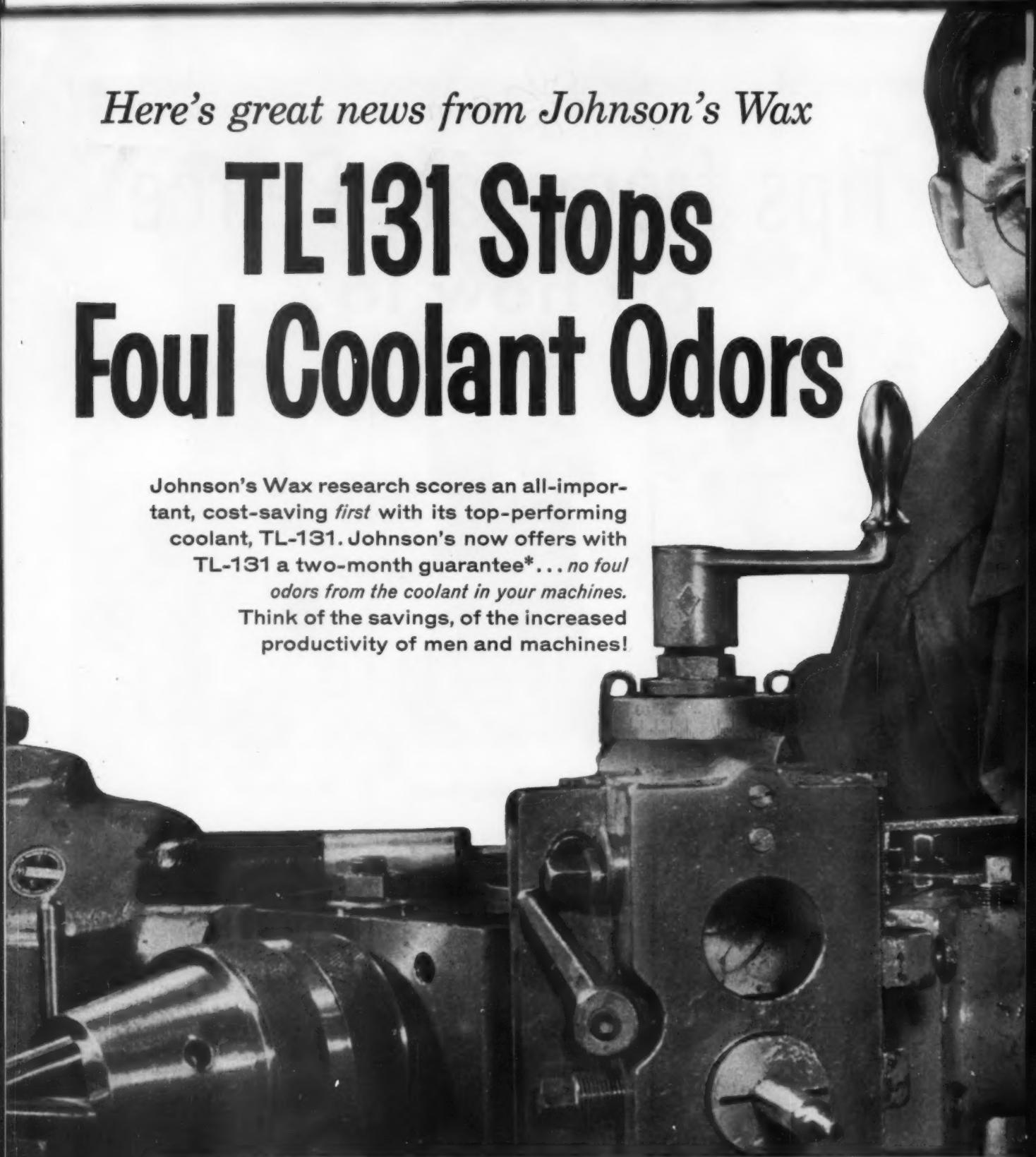


T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY · WOONSOCKET, RHODE ISLAND

Here's great news from Johnson's Wax

TL-131 Stops Foul Coolant Odors



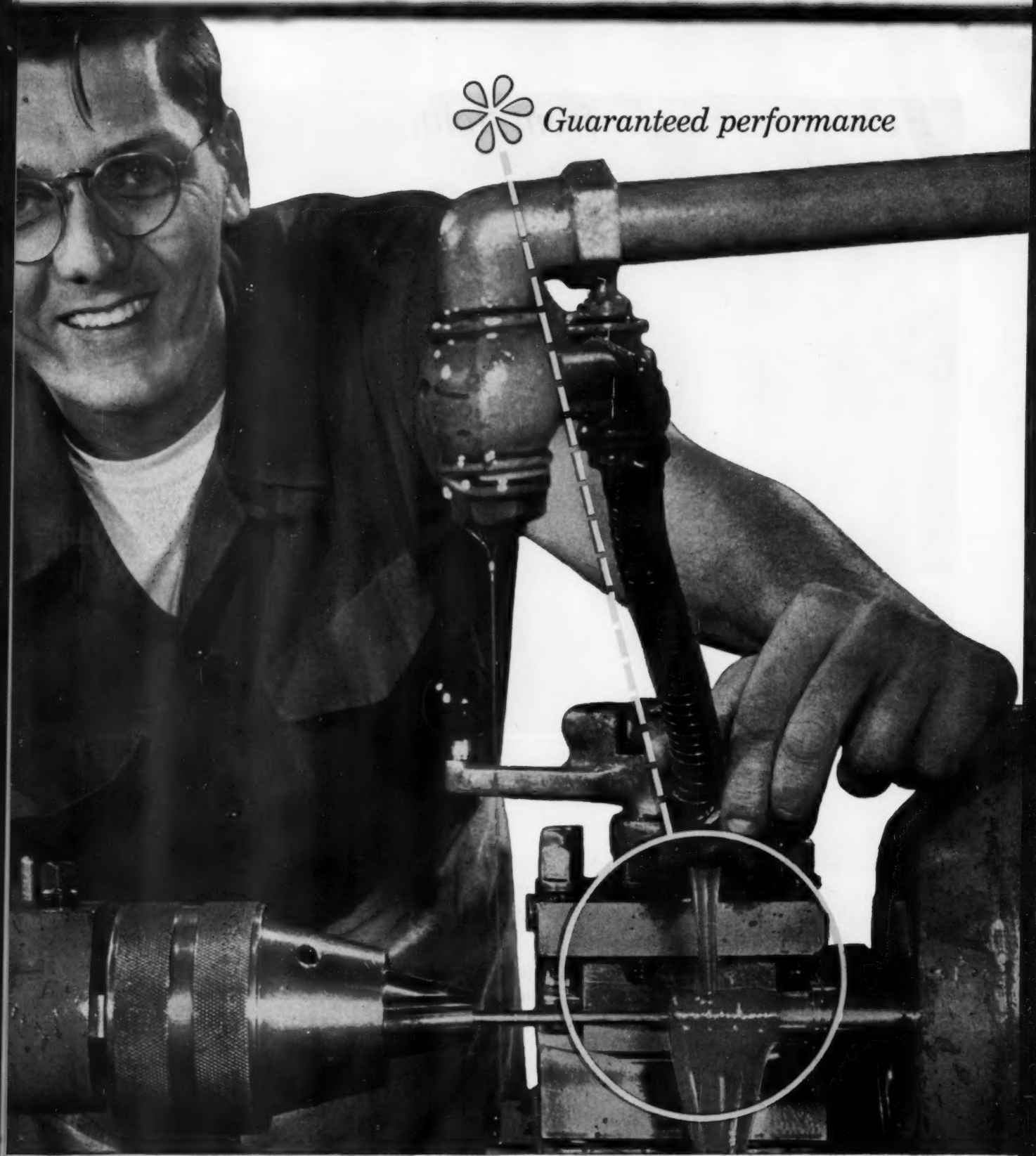
Johnson's Wax research scores an all-important, cost-saving *first* with its top-performing coolant, TL-131. Johnson's now offers with TL-131 a two-month guarantee*... *no foul odors from the coolant in your machines.* Think of the savings, of the increased productivity of men and machines!

Your money back if **TL-131** causes coolant odors

There's hot, humid weather ahead, bringing with it the headaches of coolants that turn sour and create offensive odors. Combating coolant odors is time-consuming and costly . . . changing coolants every week or two . . . using irritating bactericides.

Now, Johnson's Wax announces that TL-131 is guaranteed to solve the problem of foul coolant odors. Simply clean your coolant system thoroughly, charge with fresh, clean TL-131 (economically diluted 40 to 1 with water), and we *guarantee* TL-131 will work efficiently for two full months without causing foul odors.

In addition, TL-131 consistently outperforms ordinary coolants to provide increased tool life and greater production. Remember, TL-131 is the coolant that reduces work heat by 400°F. See your local distributor for an in-the-shop test. Mail the coupon for full information.



Mail this coupon today for FREE informative booklet on how to end foul coolant odors with TL-131.

A PRODUCT OF JOHNSON'S WAX

S. C. JOHNSON & SON, INC.
Industrial Products Division, Dept. AM-4
Racine, Wisconsin

Please send me your informative booklet on TL-131 Coolant.

Name_____

Firm Name_____

Address_____

City_____ Zone____ State_____

oughly, charge with fresh, clean TL-131 (eco- test. Mail the coupon for full information.

One of 7 Super Service Radials in use at Solar Aircraft's Des Moines plant.

Photos courtesy Solar Aircraft Company, Des Moines, Iowa.

"well pleased..."

"Our production people and our plant engineering department, who install and service equipment, are well pleased with our Cincinnati Bickford drilling machines." **• Solar Aircraft Company**

Both large and small Cincinnati Bickford Super Service Radial Drills are used here in producing jet engine components. The arm of the machine shown above is swinging over two working positions permitting the completion of all drilling operations at both stations with a minimum of work handling. Altogether there are 10 holes drilled and reamed, 18 holes drilled and tapped, and two .656" dia. half moon radii accurately machined in this tough high-alloy steel. The accuracy, speed and trouble-free performance, the power and easy control of these machines have made them popular to both engineers and operators.

Write for Catalog R-29.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

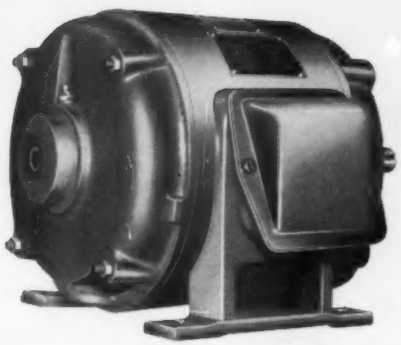
Cincinnati 9, Ohio, U.S.A.

(Advertisement)

A case of SHEAR necessity

HERE'S HOW A Century MOTOR IS Performance-Rated®

TO BRING OUT THE BEST IN THIS MASSIVE MACHINE

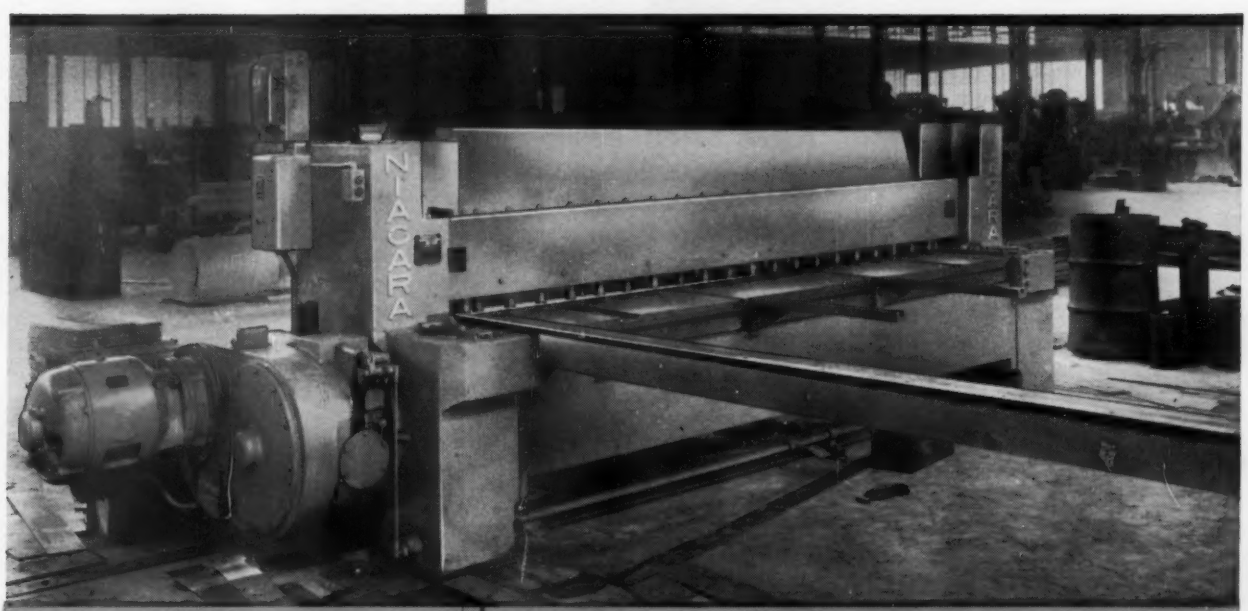


Machine Tool Motors... AC or DC... drip proof, dust proof or explosion proof frames.

This particular shock load required the speed-torque characteristics of NEMA Design "B" in a 10 H.P. polyphase motor. Century provided it in a protected, drip proof frame, with compact direct flange mounting and the terminal box out of the way at the bottom of the motor.

The owner of this shear says: "Say anything you want about it. It's giving me everything I expected... and more!"

Century Performance-Rating makes it possible to select from Century's complete line precisely the right motor size, speed, torque and frame to bring out the best performance in your equipment. Specify Century motors on your new equipment... or as replacements on your present machines. Call your nearest Century District Office or Authorized Century Distributor.



Performance-Rated® Motors
1/8 to 400 H. P.

CENTURY ELECTRIC COMPANY

1806 PINE STREET • ST. LOUIS 3, MISSOURI

13

(Advertisement)

Talking About Die Sets

WITH

PHIL MARSILIUS

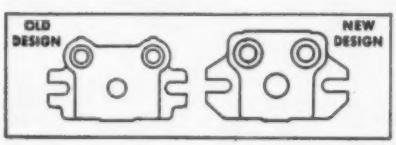
Vice-President
The Producto Machine Co.

9 Ways to Save on Special Steel Die Sets—Here are some suggestions that can save you money on machine work and shorten delivery time when you order special steel die sets: 1. Specify flame-cut edges, rather than machined edges, where possible. 2. Where close limits are not important, flame-cut clearance holes or cut-outs should be specified. Unnecessary machining increases cost. 3. For cut-outs requiring more accuracy than flame-cutting but less than machining, specify "saw-cut" to keep costs down. 4. On all types of cut-outs, keep radii in corners as large as possible.

5. Try to keep hole location tolerances as liberal as possible to reduce machining time. 6. On pin supports or bushing supports, welded construction is less expensive than dowelled and bolted construction. 7. On hold-down pads or flanges, the clamping slots should be flame-cut. 8. Bolt slots machined in pads should have one radius on the inside instead of two small radii corners. 9. Avoid special pins or bushings wherever possible.

★ ★ ★

A New Look in Die Sets—In case you haven't noticed, there's a new look in die sets. The new design offers these improvements: much more layout and mounting area on punch holders and die holders; maximum strength;



assurance of uniformly accurate location of pin and bushing holes. In addition, we felt that clean lines designed into a set would show the tooling to better advantage and make the completed unit look more like the precision instrument it really is. So you see, a die set can now make your work easier and your product better looking.

★ ★ ★

Proper Lubrication of Die-Set Pins and bushings helps to prevent seizing and galling, adds substantially to the life of your die sets. A new flexible reservoir type lubricator has been developed for this purpose. The guide bushings dip into the reservoir with each down stroke of the press, coating the entire pin with lubricant on the return stroke. It's an inexpensive way to get thorough lubrication for long periods of time without need of constant attention. Other lubrication methods will be discussed at a later date.

One of many major foundry improvements at Producto is this new continuous-pour operation which also provides continuous slag removal. The 12,000-lb. die set shown below is an example of the top-quality sets obtainable through Producto's "under-one-roof" service—pattern, casting and machining.

WHERE A BETTER DIE SET STARTS

Producto's newly-modernized foundry enables you to get higher-quality die sets...faster.

So extensive have been foundry improvements at Producto that little of the equipment or methods of two years ago remains. A new and larger cupola, stack, slag disposal unit, continuous-pour ladle, abrasive cleaning machine, sand conditioner, and conveyor systems for sand and molds have been installed.

FOR YOUR DIE SET REQUIREMENTS, THIS MEANS YOU GET:

HIGHER QUALITY sets, since Producto can produce a laboratory-controlled iron and steel mixture free of hard spots and blow holes.

FASTER SERVICE on catalog semi-steel sets, because combination of internal foundry and machine shop makes possible a full inventory at all times. Time from order to shipment never exceeds three days.

FASTER SERVICE on special semi-steel sets. A modern pattern shop in the plant expedites making patterns for your specials. No dependency on outside suppliers.

The improved foundry is but one of the reasons more and more die set users are specifying Producto. For precision die sets fast, call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Avenue, Bridgeport 1, Connecticut

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	New York	WO 4-7484
Chicago	ES 8-3307	Kansas City	VI 1162	Philadelphia	MO 4-1010
Cleveland	SU 1-6158	Los Angeles	TR 9826	Rochester	GL 1810
Dayton	MU 1651				

or check the Yellow Pages in any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With PRODUCTO Die Sets

THEY WOULDN'T BELIEVE IT

—until they SAW it!

Seeing was believing for a group of mechanical officials from one of the mid-west's most prominent earth moving equipment builders.

Frankly they just wouldn't believe that the new 32" "AMERICAN" Pacemaker Lathe would effectively use 60 horse power and cemented carbide cutting tools in machining rough alloy steel forgings. So they came to see for themselves and they saw:

1. Cuts 1⅛" deep.
2. Cutting speed 300 feet per minute.
3. .030" feed.
4. 60 to 65 horse power registered by horse power meter during the maximum cuts.
5. Not a shimmy or whimper from the machine.

They were amazed and convinced.

This new model Pacemaker is endowed with the power, stamina and convenience that combine to produce a thoroughly dependable and highly productive unit.

Bulletin No. 44 tells all . . . have one?

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

ELMES Double-Action DRAWING & FORMING PRESS

Self-Contained, Multiple Action, Moving-Down Type

"Custom Built" for deep drawing of large high-pressure gas containers

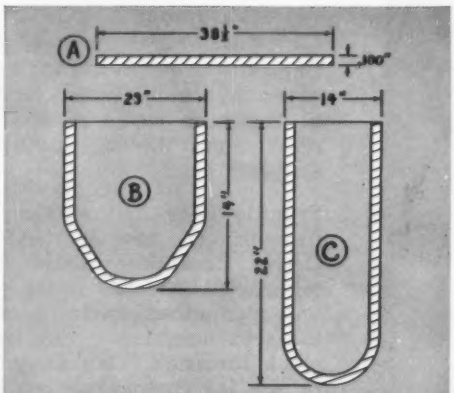
The press shown at right is a typical example of the work of Elmes engineers in designing hydraulic equipment to meet special requirements. This press is located in the plant of one of the nation's largest producers of high-pressure gas containers. A variety of container sizes, made of special high strength alloy steel, are drawn to exacting dimensional specifications. The press must maintain uniformly accurate concentric diameters and wall thickness in the part.

Many important Elmes construction and control features are responsible for maintaining the high quality and efficiency of production on this type of heavy-piece, deep-draw work. Following are just a few of these features:

- **Ring key positioning,** assuring constantly maintained "all-directional" alignment of press crown, bed, and housings.
- **Extra-long guide ways for main and blankholder slide,** counteracting all tendency of the slide to deflect during pressing operation.
- **Provision for extra-fine gib adjustment and slide alignment** obtained by use of non-metallic facing on the gibs and hand-scraped bearing surfaces.
- **Press equipped with a separate pumping unit** for powering the blankholder system. Assures maintenance of the blankholder pressure irrespective of main slide movement.
- **Individual corner pressure adjustment** provided for blankholder slide.

Elmes craftsmanship in press design and construction will assure *you* of press performance at its *best*. Recommendations and cost estimates will be promptly supplied, and entirely without obligation, of course. See your authorized Elmes Distributor, or write to us direct.

Elmes Double-Action Drawing & Forming Press, equipped with die cushion. Main platen capacity 300 tons, blankholder capacity 100 tons. For single-action operations of main platen and blankholder, capacities are combined for a total of 400 tons.



Cross-section views showing stages in production of high-pressure gas container bodies on the Elmes Double-Action Press illustrated above. The blank and first draw are produced in a single operation. (A) Circular blank. (B) First draw. (C) Final draw.

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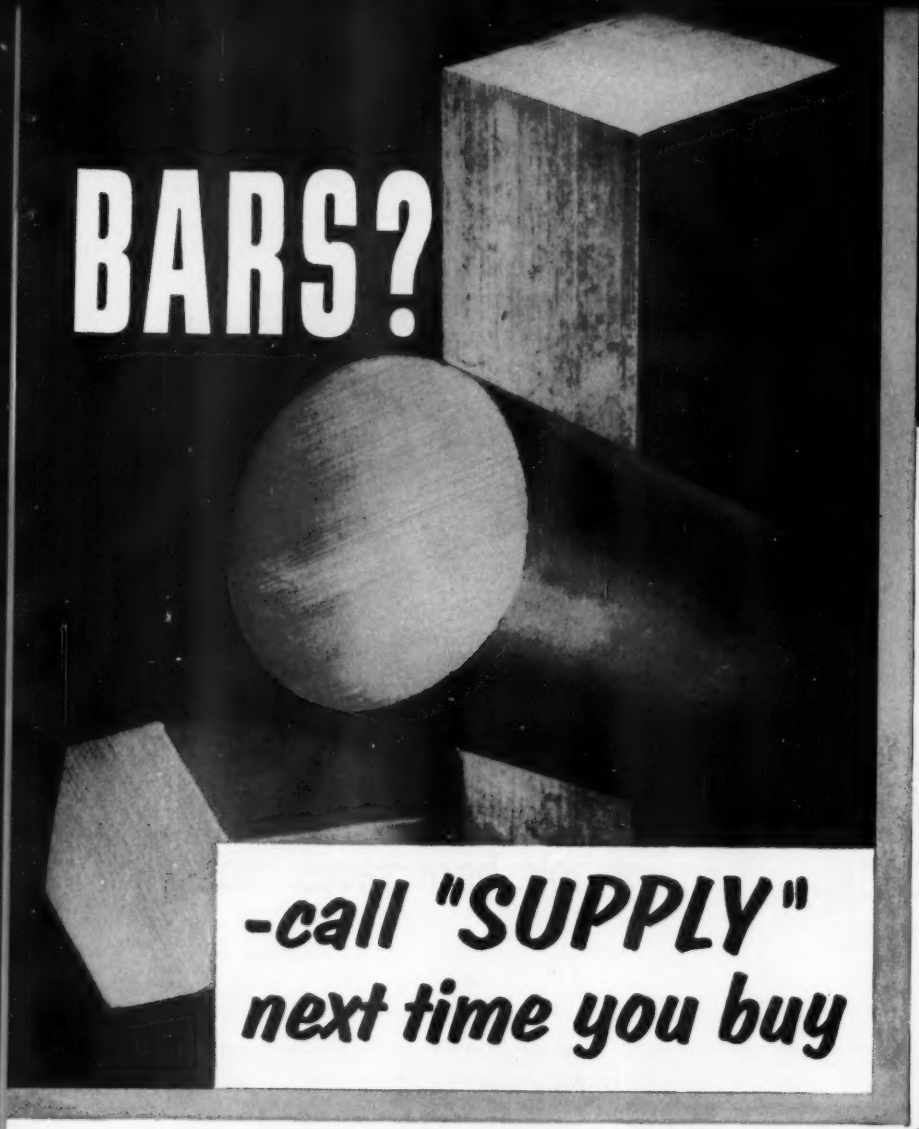

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Cold Finished—Hot Rolled—Alloy—Stainless—Aluminum—we stock them *all!* Just call us next time you need bars—any kind, any quantity. From our huge stocks we can give you speedy delivery of exactly the type, grade, size, condition and finish you want. And we are staffed to give you any technical assistance you may require.

Cold Finished Bars. Largest variety of sizes, grades, finishes in rounds, hexagons, squares, flats. Including USS "MX" high-speed, low cost screw stock.

Hot Rolled Bars. Regular Merchant Bar Quality and Special Bar Quality. Rounds, hexagons, squares, flats, half rounds, ovals, half ovals, Bar Shapes.

Alloy Bars. Hot rolled, cold finished, and Aircraft Quality. All sold with USS guarantee of minimum hardenability. Each shipment includes specific working data.

Stainless Bars. Widest range of sizes from stock or mill. Rounds, hexagons, squares, flats, angles, channels, special sections.

Aluminum Bars. High quality rounds, hexagons, bar shapes—full range of sizes.

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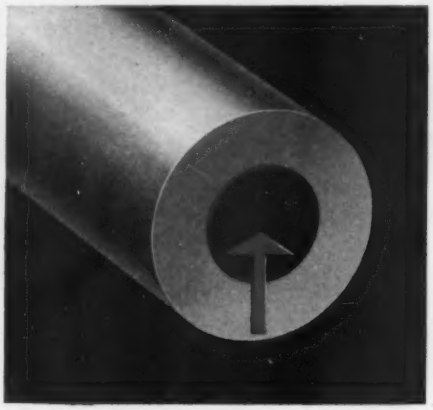

a hole here saves money

Crucible Hollow Tool Steel Bars put savings into the pockets of the metalworking industry. There's no need for costly drilling, boring, cutting-off or rough-facing operations. For the hole is already in the steel you buy. You save production time, machine capacity—avoid scrap losses.

Crucible Hollow Tool Steel Bars are now available in any of our famous tool steel grades . . . in almost any combination of O.D. and I.D. sizes. And you get *immediate* delivery of five popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air-hardening, and NU DIE V hot-work tool steels.

Your Crucible representative can show you how to save time and money with Crucible Hollow Tool Steel Bars. *Crucible Steel Company of America, Oliver Building, Pittsburgh 30, Pa.*

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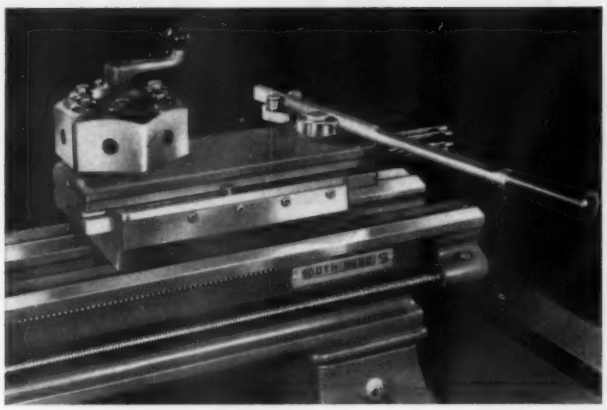
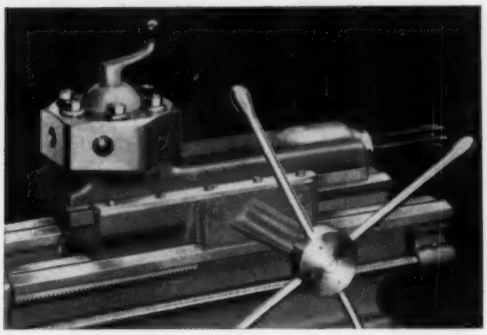
Precision-built for precision work, these South Bend Turrets simplify tooling for repetitive operations that must be held to very close tolerances. Their rigidity and accuracy permit use of maximum cuts and spindle speeds. They are representative of 165 attachments, tools and accessories that are designed for South Bend Lathes. Use them to simplify routine operations or to tool up special jobs economically. Reasonable prices enable you to do this profitably — another reason for using South Bend Lathes. Write for Attachment Bulletin 5321.



HANDLEVER BED TURRET

Mounts any place on bed. Indexes ± .0005" at 4" from turret face Hardened, ground and superfinished index pin. Indexes automatically. Automatic feed stop for each position. Effective slide feed 4". Tool holes ⅜" or ¾".

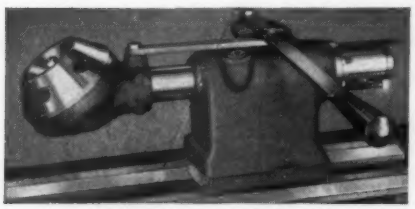
Size Lathe	Catalog No.	Price
9"	CL1611N	$273.
Light Ten	CL1611K	280.
10"	CL1611R	286.
13"	CL1611T	308.



HAND FEED TURNSTILE BED TURRET

Mounts any place on bed. Indexes ± .0005" at 4". Hardened, ground, superfinished index pin. Indexes automatically. Automatic feed stops. Effective slide feed 5⅞". Holes for 1½" tool shanks.

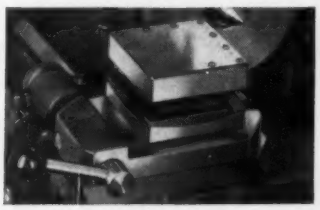
Size Lathe	Catalog No.	Price
16"	CL1917H	$683.
13"	CL1917T	495.



HANDLEVER TURRET

Replaces tailstock. Index lock releases automatically. Automatic feed stops. Manual indexing of turret. Holds 6 tools with ⅝" shanks. Maximum stroke length of turret slide is 3¾".

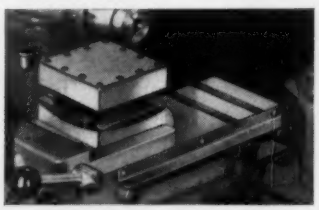
Size Lathe	Catalog No.	Price
9"	CL2045N	$116.
Light Ten	CL2045K	123.
10"	CL2045R	134.
13"	CL2045T	161.



SQUARE TURRET TOOL BLOCK
for Compound Cross Slide

Mounts 4 cutting tools. Turret indexes within .0005" to 4 positions. Quick acting lever lock.

Size Lathe	Catalog No.	Price
9" & 900	CL3375N	$46.00
Light Ten	CL3375K	48.50
10" & 1000	CL3375R	52.00
13"	CL3375T	58.50
14½"	CL3375F	84.00
16" & 2-H	CL3375H	91.00



SQUARE TURRET TOOL BLOCK
for Double Tool Cross Slide

Mounts 4 cutting tools. Turret indexes within .0005" to 4 positions. Quick acting lever lock. Rocker adjustments for tool height.

Size Lathe	Catalog No.	Price
9" & 900	CL3376NR	$41.50
10", 1000	CL3376NR	41.50
Light Ten	CL3376K	41.50
13"	CL3376T	57.00
16" & 2-H	CL3376H	85.00

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OUR PRICES ARE LOWER
than they were back in 1941

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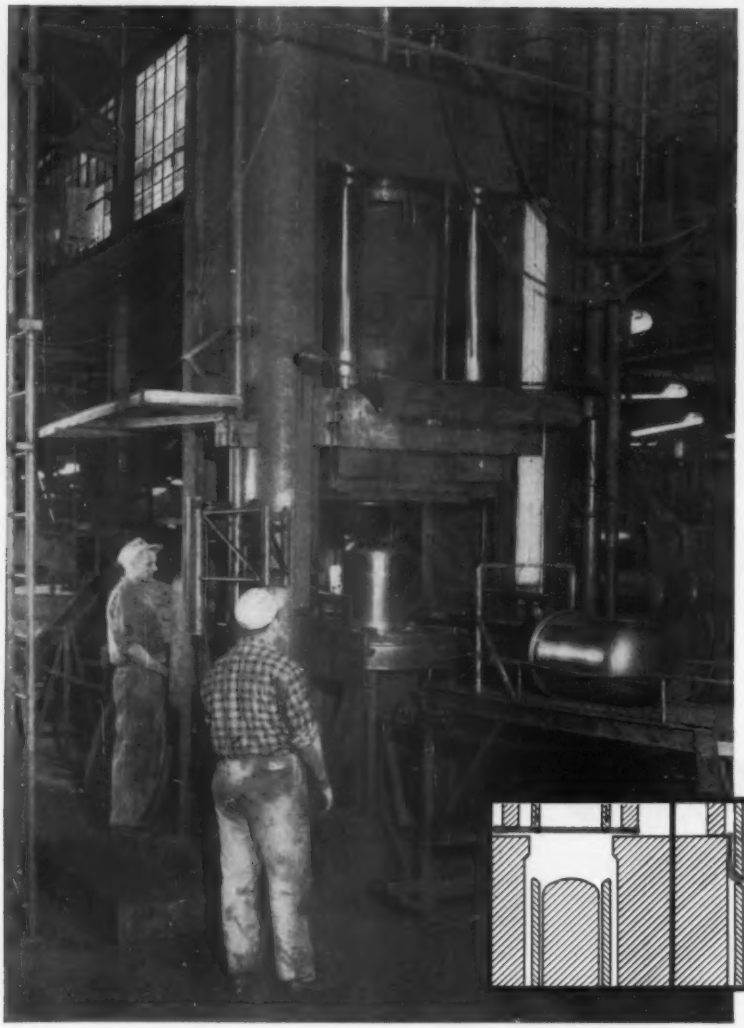
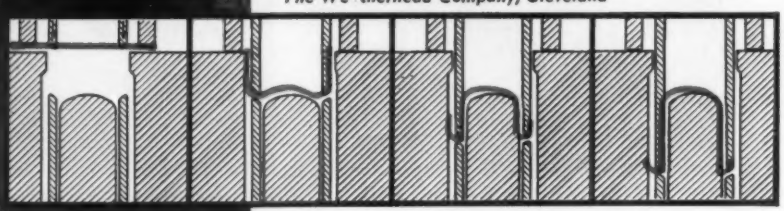
Half-a-Cylinder IN ONE PRESS STROKE!



K. M. Wilmore, Plant Manager, The Weatherhead Co., reports on their success with an H-P-M press using the reverse draw method. *"Our 500-ton H-P-M has operated 'round the clock for months at a time during the past five years. We are very pleased with its performance in the manufacture of 100-pound capacity L-P Gas cylinders."*

K. M. Wilmore, Plant Manager
The Weatherhead Company, Cleveland



H-P-M 500-ton press drawing L-P Gas cylinders at Weatherhead.

In the reverse drawing method, this H-P-M press transforms a blank into a shallow cup. Then it literally turns the cup inside out as it continues the draw — all in one continuous stroke. It does the work of several presses; handling and heat-treating between draws are eliminated. Parts are uniform in thickness and quality . . . rejects are reduced to a minimum.

The H-P-M FASTRAVERSE press is infinitely adjustable, permitting the press to be easily and quickly regulated for each specific draw job. Accurate control of drawing speed, plus total elimination of high impact stresses, guarantees proper metal flow. Independent control of each hydraulic action provides just the right tonnage for each job. Investigate these versatile "all-hydraulic" production units. Draw your sheet metal hydraulically.

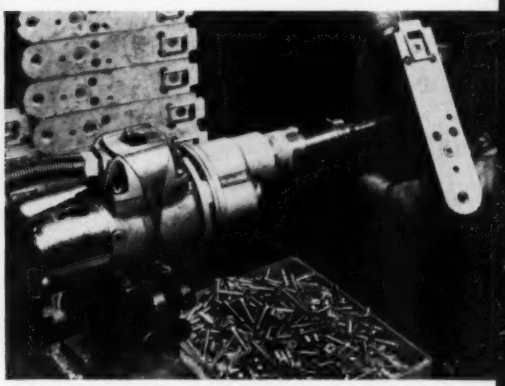
THE HYDRAULIC PRESS MFG. COMPANY

1002 MARION ROAD, MOUNT GILEAD, OHIO, U. S. A.

HPM

TEN IN THE TOP. 10 Phillips self-tapping screws hold top panel to the frame of the Fedders ¾ ton room air-conditioner. "We found employees on the assembly line are the best salesmen for Phillips screws," says the assistant plant manager. "Rapid driving of the screws is important to them because they are on piecework."

STEADY ON THE STABILIZER. Here is the final assembly of the top cover of a horizontal stabilizer at Republic Aviation. The purchasing agent said, "You can really foul it up with one of those speed guns if it slips out of the screw slot, but the Phillips type head helps to prevent slipping. It holds on to the driver bit much better than the old-type screw."



5,000 WINDOWS in U.N. Building, New York City, have Caldwell clock spring sash balances. "We depend on the worker's adjustment of the Phillips head screw to make the balance function perfectly," says Caldwell's production manager. "We now use two sizes of Phillips recessed-head screws . . . and have speeded assembly. Our power drivers are mounted horizontally, since we discovered the units are easier to move around than the drivers."

NEW DISCOVERIES IN ASSEMBLY

Many manufacturers in many fields are finding Phillips Cross-Recessed-Head Screws lead to better methods and results

Allmetal Screw Products Company, Inc. • American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Company • The Eagle Lock Company • Elco Tool and Screw Corporation • Great Lakes Screw Corporation • The H. M. Harper Co. • The Lamson & Sessions Company National Lock Company • The National Screw & Manufacturing Co. • Parker-Kalon Div. General American Transportation Corporation • Pheoll Manufacturing Company Rockford Screw Products Company • Scovill Manufacturing Company • Shakeproof Division Illinois Tool Works • The Southington Hardware Manufacturing Company Sterling Bolt Company • Universal Screw Company • Wales-Beech Corporation

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

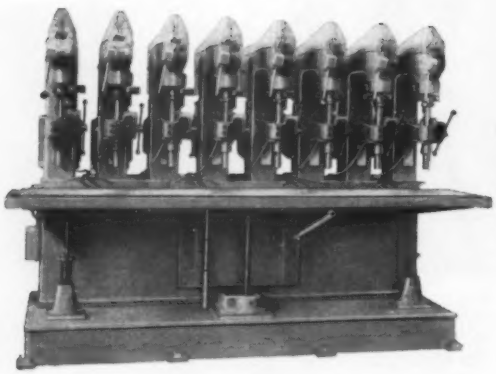
THE FASTENERS OF TODAY ...AND OF THE FUTURE

X marks the spot

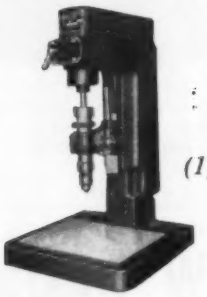
... the mark of extra quality

Whatever your light and medium duty drilling needs, it's a sure bet that the machine

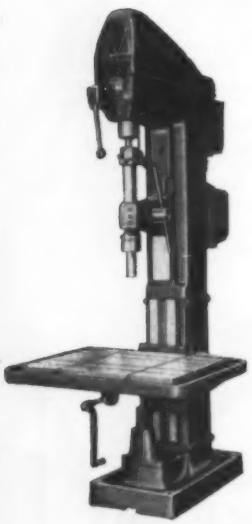
Avey has the right one



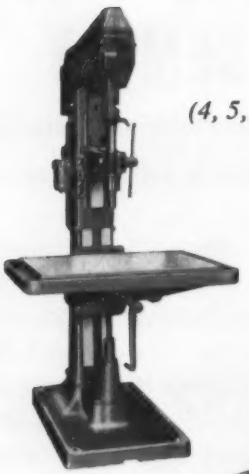
(7) Super 8 spindle



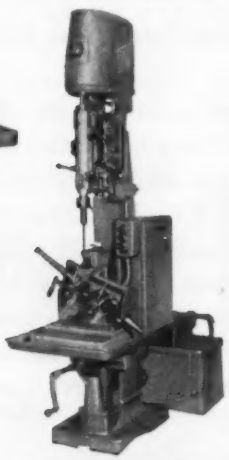
(1) Bench type

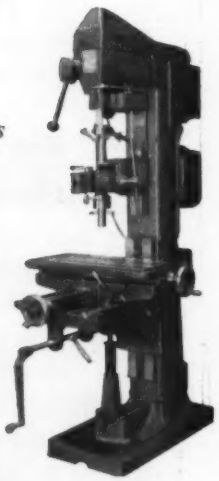


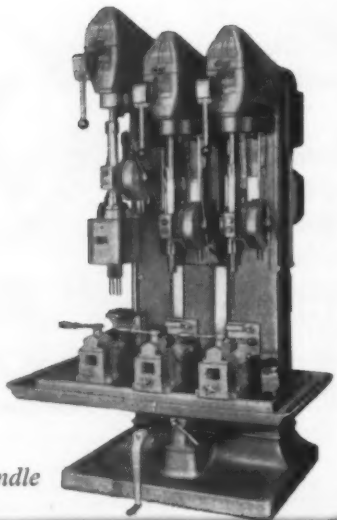
(2) Column type



(4, 5, 6) Tool room drills







(3) Multi-spindle

Whatever your light and medium duty drilling needs, it's a sure bet that the machine you need is made by Avey. The whole Avey line would pack this magazine with pictures —would give you every combination of size, capacity, speed, overhang, and table arrangement to fit your requirements. The ones shown will give you the general idea. Write for literature.

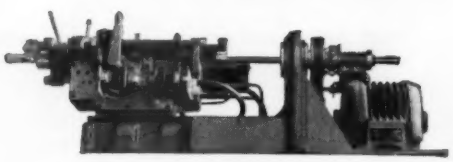
(Figures 1 through 6) Standard Drilling and Tapping Machines. Capacities in cast iron from very small numbered drills to 1½″; 6 or 8 speeds up to 12,000 rpm; No. 32 Jacobs chuck to No. 4 Morse taper; 4 feeds; 1 to 6 spindles; column or bench type; wide range of swing. Featuring such "bonus" advances as micrometer stop collar; telescoping spindle guard; dynamically balanced rotating parts; rack and pinion operated motor plate; large tool and die shop tables; and Avey's pace-setting spindle construction.

(4, 5, and 6) Avey tool room drills, built in No. 2 and No. 3 BMA-6 sizes. Large table 34″ x 25″; round table 18″ diameter; compound table 25″ x 12″.

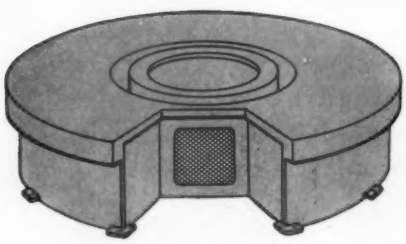
(7) Super 8 Spindle Drilling and Tapping Machine. No. 2 Morse taper. Power lift to table by push button control. Hand feed, power feed, lead screw tapping. Four feeds, 6 speeds. Built-in coolant system.

for Avey makes them all

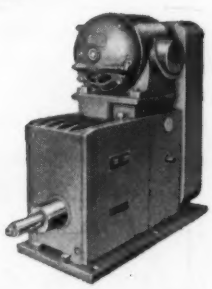
Avey



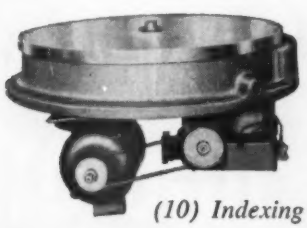
(9) Avey-draulic



(11) Standard base



(8) Cam feed unit



(10) Indexing table

(8) Automatic Cam Feed Units. For drilling, tapping, reaming, hollow milling. Vee belt or gear drive. Nos. 1, 2, and 3 Morse taper. Capacity in cast iron: No. 1, ½″; No. 2, 1″. Mount at any angle. Fully or semi-automatic. Self-contained, tamper-proof.

(9) Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Jump feed attachment available. Standard strokes 12″ up to 30″. Avey's patented Torque-matic control optional.

(10) Automatic index tables. Rapid, accurate indexing to .001″. Even or uneven index patterns obtainable. 16″ to 48″ diameter. All adaptable to Avey standard bases.

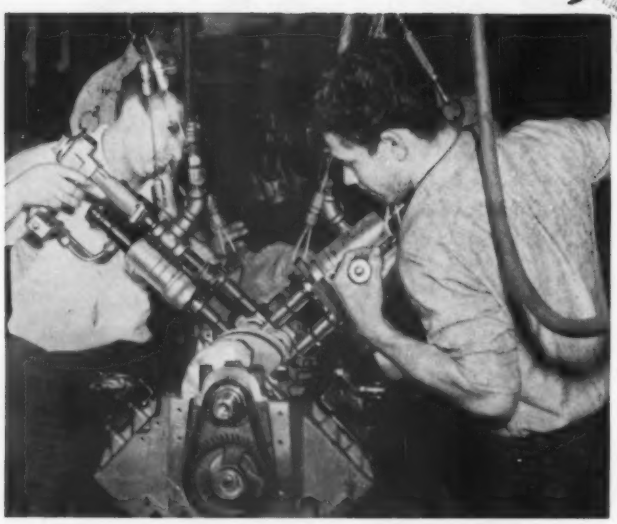
(11) Steel Bases. One of Avey's standard line of fabricated bases. Stress relieved, sandblasted, machined, and painted to fit your application. Combine 8, 9, 10, and 11, and you get fast returns on your investment, and a step ahead of your competition!

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

(3) Multi-spindle

Multiple Spindles provide Greater Output!



2-Spindle Multiples tighten connecting rod bolts on the assembly line.

A 6-spindle Multiple Nut Setter assembles automobile crankshaft to flywheel.

The new Keller Multiple Nut Setters improve quality control and reduce production costs. Manufacturers have been quick to make use of their advantages:

1. Built-in torque regulation in each individual spindle, giving control of torque on each bolt. Torque is adjustable from 4 to 190 ft/lb.
2. Torque held within close tolerances—comparable to that obtainable with accurate hand tools.
3. Increased production and lower production costs.
4. Easily adaptable to changing needs . . . a change in bolt spacing merely requires a new mounting plate for the spindles . . . when a job is completed the spindles are completely salvageable for use in another Multiple.

Do you have applications where bolts or nuts can be run and tightened two or more at a time? If so, it will pay you to investigate this remarkable tool. Write for Bulletin 16-101.

GARDNER-DENVER Since 1859 K KELLER TOOLS

KELLER TOOL

DIVISION OF **GARDNER-DENVER**

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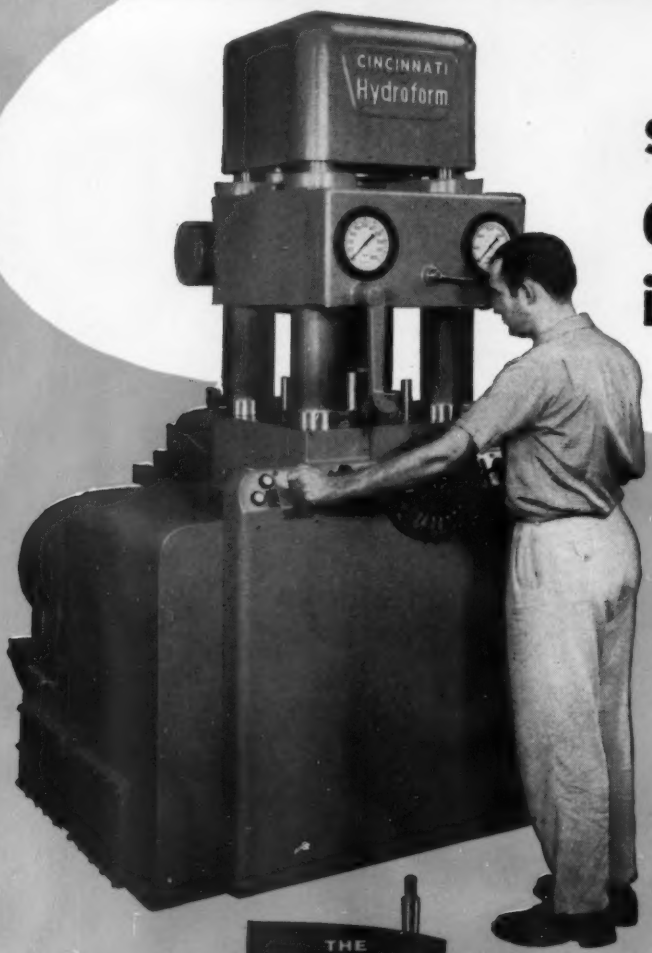


small size producer of BIG SIZE SAVINGS in metal forming . . .

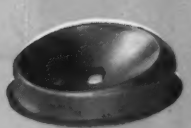
The New Cincinnati 8" Hydroform

The new Cincinnati 8" Hydroform duplicates the performance of its larger family members—the 12", 19", 23", 26", and 32" size machines—by producing a wide variety of deep drawn parts . . . with lower tooling costs . . . at a faster rate . . . and with higher standards of quality than is possible to obtain by other methods.

And it takes up less plant floor space than some soft drink dispensing machines occupy.

Typical examples of work formed on the 8" Hydroform are shown at left. Listed below is a table of major machine specifications.

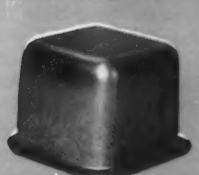
If your manufacturing requires the production of drawn shapes in small lots—or extensive development work prior to quantity production—let a Cincinnati Milling field engineer show you how the many Hydroforming advantages can be profitably applied to your work. For a description of the Hydroforming process and specifications of the six machine sizes, write for Bulletin M-1759-3.



Reflector of .020" Aluminum, drawn, pierced and trimmed in one operation.

Electrical Detail of .042" stainless steel, drawn in two operations.

Jet Engine Detail of .032" Inconel, drawn with flange on an angle with the balance of the part in one operation.



Cover of .060" 2S0 Aluminum, drawn in one operation.

Work Capacity:
Maximum Blank Diameter—8"
Maximum Draw Depth—5"
Maximum Blank Gage—¼" steel
Maximum Forming Pressure—15,000 psi

Machine Operating Rate:
Maximum—200 cycles per hour

Dimensions:
5' x 5' x 7½' high

Weight:
Machine Net—12,000 lbs.

Installation:
Floor Mounted. Requires water and electrical connections.

Hydroform

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

WESTERN UNION TELEGRAM
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PITMAN ARM TAPER SERRATIONS BROACHED & SWAGED IN SINGLE
OPERATION ON 35 TON COLONIAL ASSEMBLY PRESS. 32 INTERNAL
(36 INDEX) SERRATIONS, STARTING IN 1.005" ID HOLE, BROACHED
& TAPER SWAGED IN 12" STROKE.
PRODUCTION RATE 125 PER HOUR. WORKING SPEED 8 FT/MIN.
STRIPPER PLATE HOLDS PART WHILE BROACH RETURNS AUTOMATICALLY.
DEPTH OF SWAGE & TAPER SERRATION ACCURACY CONTROLLED BY
ADJUSTABLE GUIDE BAR STOPS. THROAT OPENING REINFORCED BY
EXTERNAL STRESS BARS TO MAINTAIN ACCURATE ALIGNMENT AT ALL
OPERATING LOADS. REQUEST BULLETIN PA-52.
COLONIAL BROACH CO
1229P
Note—Broach and Swage in one operation
COLONIAL
PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH CO.
DETROIT 13
UNIFIED BROACHING is the key to successful broaching

Shop talk on machining Stainless Steel

keep tools properly sharpened and free from backlash

By their very nature, Stainless Steels are tough and machining them requires a slight departure from practices followed with mild steel. But with properly ground and sharpened tools, rigidly mounted to keep them free from backlash, you can machine Stainless Steel with no difficulty.

Ferritic Stainless grades are the easiest to machine; martensitic grades are somewhat more difficult, and the austenitic grades require the most care because the surface may work harden if tools are dull or allowed to "ride."

The use of lubricants will facilitate cutting and prevent tools from becoming overheated. The proper lubricant can prevent heat from building up in the first place.

"A heavy cut with slow speed" is a good rule of thumb to follow in working with Stainless Steel.

Several free-machining grades of Stainless Steel such as USS 12 FM and USS 18-8FM are available. They are special compositions with non-seizing properties and are designed primarily for automatic screw-machine operation.

For specific information on such machining operations as turning, milling, machine forming, threading, drilling and tapping, send for a copy of our "Fabrication" book. Our representatives, too, will be glad to assist you with your shop problems. For your copy of the book, write to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

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For prompt service on your immediate requirements, call your warehouse distributor who handles USS Stainless Steel. He can offer you fast delivery.

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NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS STAINLESS STEEL

USS

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PIPE · TUBES · WIRE · SPECIAL SECTIONS

S-1025

UNITED STATES STEEL

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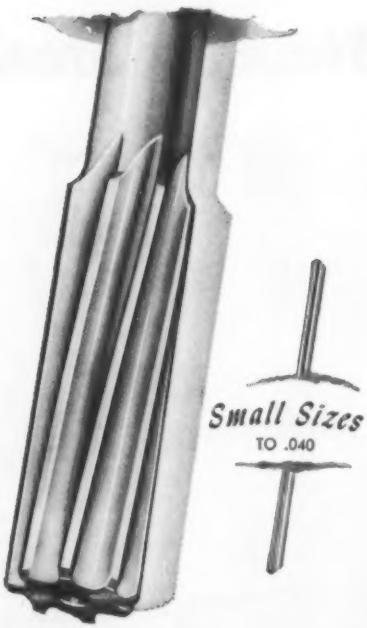
TO 1½"



Small Sizes
TO .040

L&I

The Reamer Specialists
LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Teach 'Em Right

Your article, "Train Diemakers or Die" (*AM* — Feb 14 '55, p137) particularly attracted me. For the past 25 years I have been an instructor in machine shop practice and have always stressed the importance of thorough training through the completion of apprenticeship, and the relative merits for future employment and promotion. It has always required pressure and good training methods to make the boys follow through. Sometimes the response has been discouraging, but the percentage of those who came through after graduation from high school was encouraging.

For years I have been concerned about the discontinuance of machinist apprentices by one company after another. On the other hand, educational authorities set up educational obstacles that prevented getting tradesmen as instructors. This broke down the recruitment of prospective machinist apprentices, through too-elementary shop practice and unethical shop instruction by those with inadequate knowledge of shop practice. The teacher's colleges cannot furnish sufficiently trained shop instructors to replace the know-how of tradesmen.

It seems to me that some serious thinking has got to be done by industrialists, educators, union leaders, and government officials. Unless we have intelligent cooperation and coordination in this apprentice training crisis, we shall lose the production ability that has made this nation great in living standards. We cannot depend on immigration of foreign-trained tradesmen to fill our needs for skilled men. There is more need for apprentice systems now than there was when immigration was greater. Any other thought to the contrary is silly.

Alfred Grayshon
Machine Instructor
Olney High School, Philadelphia

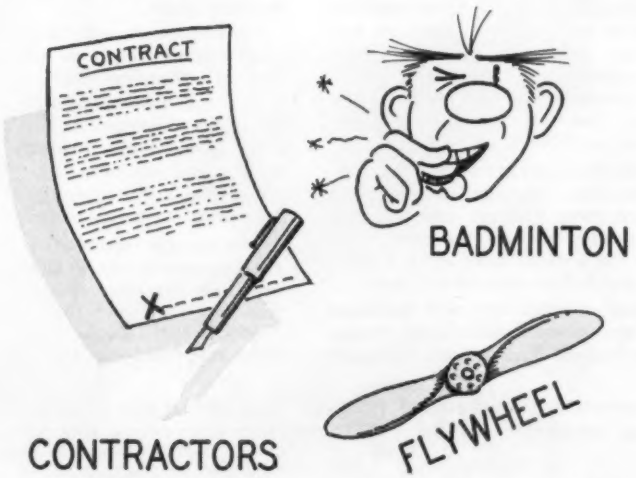
No Cause for Action

I have always associated "backlash" with inanimate objects, the nemesis of the apprentice and experienced hand alike. If you've ever been "brought up short" by a backlash while casting for that "big one" lurking just beyond the surf, you have a clear picture of a man with a slightly shaken sense of humor. Nevertheless, if he's got any salt, he'll unravel the tangle and cast again.

With these thoughts in mind, I'll

GRINETICS

By D G SMITH



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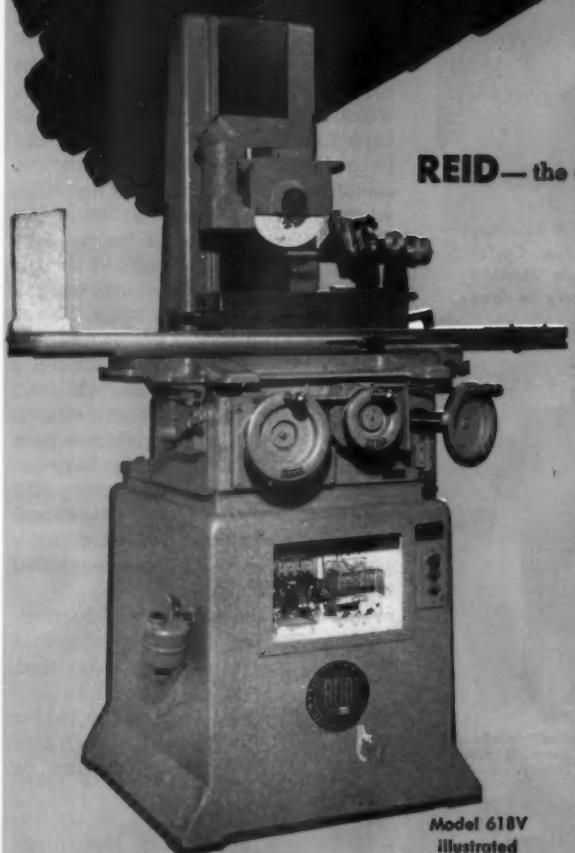

Model 618V illustrated

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EASIER OPERATION

. . . finger-tip level controls eliminate stretching and bending, lessen operator fatigue. And, electrical controls are fully visible, yet protected behind a transparent shatter-proof panel.

BETTER SURFACE FINISHES

. . . hand scraped ways for smooth running; a motorized spindle turning on pre-loaded bearings, to eliminate wheel chatter, produce ground pieces with visibly finer surface finish.

RUGGED DESIGN

. . . all mechanical units built around rugged one-piece column casting to insure permanent alignment of cross-slide saddleways and vertical headways. Column is mounted *on* heavy cast iron base for maximum rigidity and freedom from vibration.

ECONOMICAL

. . . in both *initial cost*, and continued, trouble-free operation, Reid grinders are quality engineered throughout to provide accuracy and dependability.

CAPACITY

. . . 6" x 18" x 17¼" (from center of spindle to work-table). Choice of four models: either hand feed table, or power feed table with speed variable from 12 to 35 feet per minute. Complete accessories for wet or dry grinding and special operations are available.

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for
- ✓ Marking round surfaces
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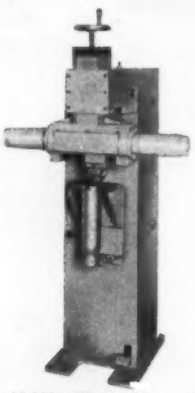
- ✓ Precision graduating
- ✓ Serial numbering
- ✓ Knurling

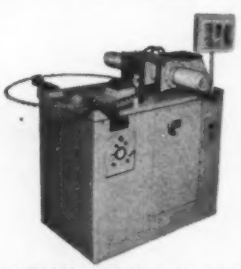
Model 46-354 marks bearing races 1" to 6" in diameter. Cyclomatic Control and air ejection require operator merely to load piece parts.

The NOBLEWEST Series 46 is a truly new concept in universal roll marking. Its *Dual-Function Head* incorporates a pneumatic pressure ram for depth of mark and a pneumatic die slide for roll marking. Combined in one integral unit, this new design offers wide flexibility in *machine design*—and *work capacity*. As illustrated, the *Dual-Function Head* can be mounted horizontally, vertically or at an angle . . . thus permitting a wide range of product application. Like all its famous predecessors, it employs the original NOBLEWEST roll marking process—producing sharp, permanent, sunken impressions—*good for the life of your product*. Whatever your needs for metal marking, NOBLEWEST makes the machines, marking dies and work-holding fixtures for doing the complete job faster, better, at lower cost. Write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Conn.

A few desirable territories open to qualified representatives.



Model 46-982 (Vertical) marks flat surfaces from shell cases to kitchen utensils with equal facility.



Model 46-387 marks large diameter jet engine rings and similar parts.

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NOBLEWEST
ORIGINATORS OF THE ROLL MARKING PROCESS
EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

venture out on the stormy sea of protest which followed in the wake of my note (*AM*—Dec 20 '54 p69) concerning your discussion "Slide Rule Foreman" (*AM*—Oct 25 '54 p157).

The rightfully indignant gentleman from Houston and the protesting student from Buffalo (*AM*—Jan 31 '55, p74 & 77), representing between them the established and future engineering personnel of this country, deserve an explanation.

If sweeping the chips from the shop floor and keeping the machinery spotless (the task usually associated with the low man on the totem pole of shop seniority) can be construed as "menial;" if time spent inquiring for the left-handed monkey wrench and the proverbial skyhook can be considered akin to shop experience; if subsequent years spent in various capacities throughout the shop can be termed as "mingling with my social inferiors;" if soaking my "lily-white hands" in blueprint developer long before I ever got to "push a pencil" can be called part of a basic appreciation of the attributes of shop experience; then I can honestly say I have that appreciation.

One thing that has always been a source of pleasure to me (I don't think I'm alone in this) and that is the feeling of friendly rivalry which exists in the relationship between Engineering and Manufacturing. It's the friendly rivalry, the good-natured joshing, that has prevented many a tense situation from being magnified beyond all proportion.

It was in the interests of furthering this spirit of friendly rivalry that my note was respectfully submitted.

A firm foundation in shop experience is indeed a "step up the ladder of success" whether the ultimate goal be in the field of engineering or elsewhere.

Believe me, gentlemen, to contradict such a universally recognized basic truth was not my intention.

Eugene K Chapman, Jr
New Bedford, Mass

Monster

Your series of editorials on the subject of "Automation" is not without immediate interest to industry today. It is difficult to see how American

manufacturing can continue to compete successfully in the world market without utilizing increasing use of the operational economies automation affords.

But it is perhaps unfortunate that your metaphorical description of automation as a Frankenstein (*AM*—Jan 6 '55, p95) tends to obfuscate rather than to clarify this vital issue. If it seemed undesirable to speak of business management as the Frankenstein (which, of course, it more nearly is) and automation as Frankenstein's monster, it might have been better to make another choice of metaphor altogether. It has always been discouraging to me to see this most descriptive trope misused, and in a publication of your standing it is particularly disheartening to think that an inaccurate use of such a fine figure of speech would be deemed necessary to put a point across. If "Walter Reuther and his union cohorts" had, in fact, used this term improperly, it should be the part of such a responsible journal as *AM* to correct and clarify its meaning, rather than to compound the error and thereby to give it tacit approval.

Obviously, Mr. Reuther is intelligent enough to appreciate the immense value of automation to the working people of this country. It is hoped that the blind pressures behind him will not be great enough to enforce unyielding inflexibility in his expressed determination. . . .

D G Weaver
Port Huron, Mich

ASME and AOA

I was most surprised to read (*AM*—Feb 14 '55, p172) that *American Machinist* was actually heavily involved in the creation of ASME. Has there ever been a similar case in which a magazine founded a national society? As you evidently never tried to control the organization, I can't see what you got out of it. So it must have been done in a spirit of pure public service, and I honor you for it.

Henry Farbstein
Chicago

Yes, there is a similar case. AM *was also responsible for the creation of the Army Ordnance Association (now American Ordnance Association). Shortly after the end of World War 1,* AM's *editors, who had been extremely active in ordnance work, conceived the idea of an organization and, with Army approval and assistance, brought it into being. The first AOA office was a desk in the* AM *office, and* AM *provided the financial support for the first year.*—Ed.

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Universal Tool and Cutter Grinders

When you equip your toolroom with an Oliver ACE to maintain "top" performing cutting tools the flow of production won't get too heavy and out of control . . . you won't risk costly "slow-downs" in your schedule or wasteful and expensive product rejects.

"TOPS" in precision, the ACE handles a wider variety of cutters than ordinary cutter grinders . . . handles the toughest grinding jobs with ease including, of course, Tungsten-Carbide work and high speed milling cutters and tools.

"TOPS" in economy, the ACE is easy to set up . . . needs only a small amount of floor space . . . requires less outlay of dollars. The ACE cuts time lags to the bone . . . the simplicity of design and operation makes economy of motion and fast grinding certain—only two simple fixtures required.

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Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular wood saws.

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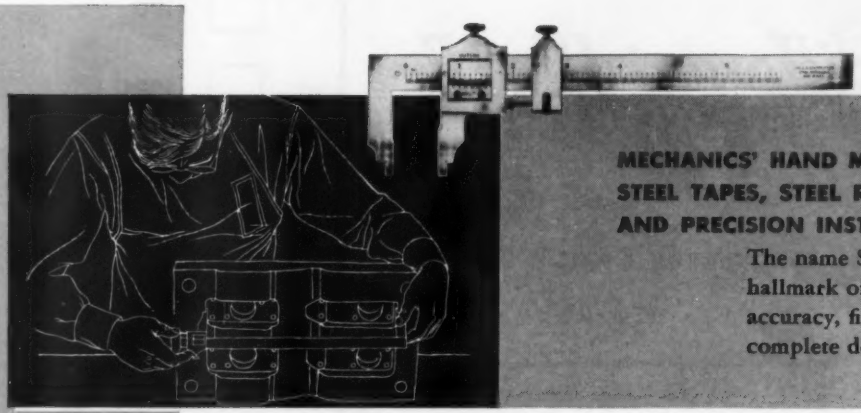

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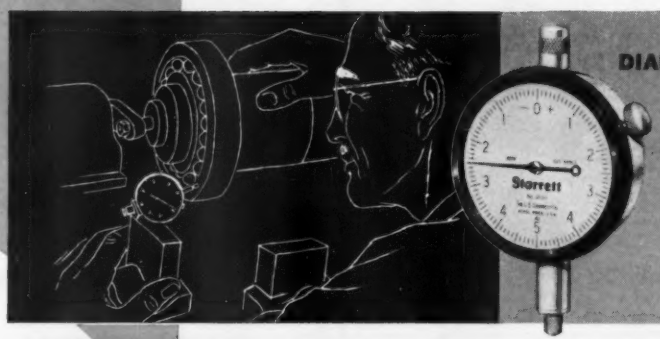

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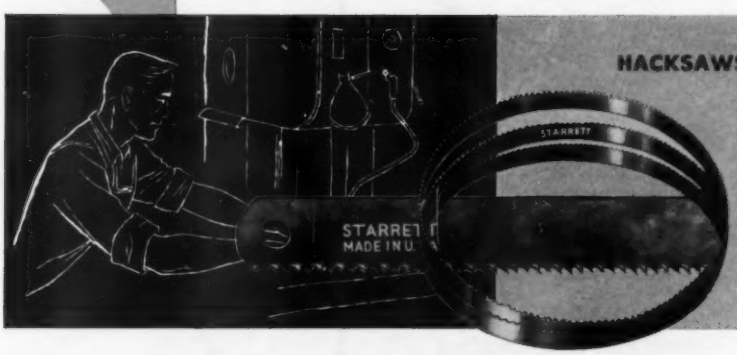

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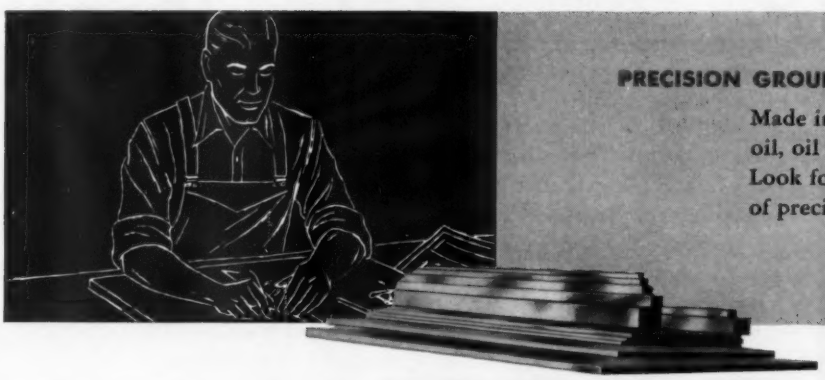

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☐ 100 ?

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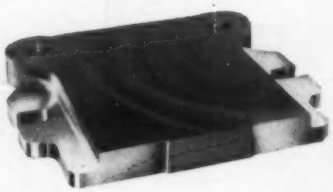
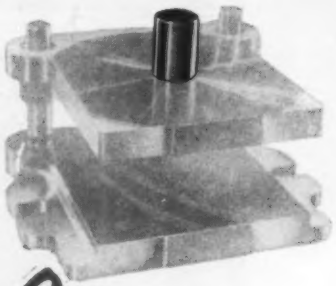
3 different punch holder thicknesses

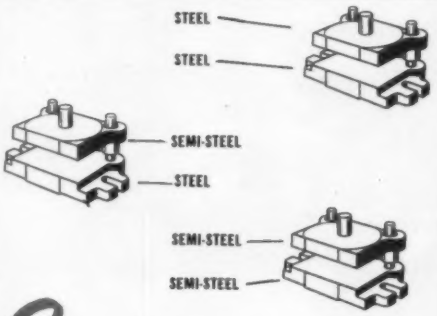


3 different die shoe thicknesses



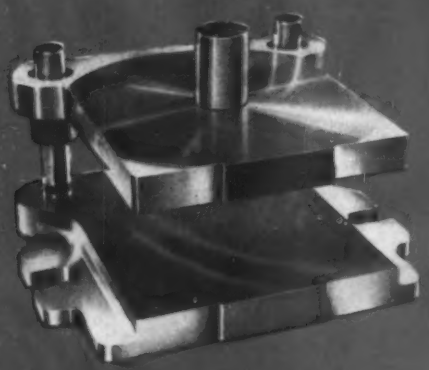
6 shank size variations

4 bushing type variations



3 different material combinations

16 guide post lengths in each of **3** different styles to choose from



Multiply all of these combination possibilities together and you'll discover that there are *31,104* different standard Danly Die Sets in just this *one* size . . . and all are cataloged and *stocked* in the Danly Branch near you. Amazing? Yes, but it serves to illustrate an important point for *your* benefit. The almost unlimited variety of Standard Danly Die Sets *in stock at your Danly Branch* will meet your specific needs exactly . . . and fast. So remember, when you want the best in die sets in the shortest time, the place to call is your local Danly Branch.

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DIE SETS . . .
STANDARD OR SPECIAL

DIEMAKERS' SUPPLIES

Spot News of Metalworking . . .

Ford is said to be readying a new passenger car line. Called the Model "E" around Ford, it won't be ready for two years or so. (See Field Report USA, Detroit—p165).

Four biggest die forgings replace 272 parts: 11-ft aluminum wing spars, produced on a 35,000-ton press by Wyman-Gordon for Convair under the AF Heavy Press Program, replace 272 parts and 3200 rivets, at the same time cut plane weight 100 lbs.

Automation will mean more, smaller plants—widely dispersed. That's the opinion of automation expert Cledo Brunetti of General Mills, who gives these reasons: because automated plants have higher output, they're not dependent on urban labor pools, can be located closer to raw materials; automation's horizontal production lines call for one-story buildings, with output concentrated into a much smaller space.

Device that feeds screws automatically, almost instantaneously, from a hopper to a head that fits any standard power screwdriver has been developed by Pneuma-Serve Inc, Cleveland. Unit is basically designed to augment hand-power equipment, but is adaptable to automation. Tests show fastening operation speedup of 50-400%.

GAW — open sesame to nationalized industry? One top auto parts maker thinks GAW could be the opening wedge for unions to step into management areas like plant expansion, scheduling, sales and pricing, even industry-wide planning. This, he thinks, would make it easy for an extremely liberal government to nationalize industry.

First Soviet industrial trade fair to be held in the Western Hemisphere starts April 30 in Buenos Aires, will display machine tools, trucks, autos, and agricultural, textile, road-building and oil-field machinery.

At its present rate of apprentice training, the U S tool and die industry will have only one-third the number of skilled workers 25 years from now it has today. That statement was made recently by industry spokesmen at a conference with Business & Defense Services Administration.

Tool and die shops are already getting orders for 1957 Ford tooling, trade sources say, in preparation for a major, possible complete, body change.

German manufacture of aircraft parts and equipment may start up again on or about June 1 for the first time since World War II. Until Germany gets the go ahead to make whole planes, output will be exported.

Congress may look into automation's effect on employment. UAW-CIO's recent Washington conference on automation, timed to coincide with GAW talks in Detroit, could mean that (1) Reuther is trying to call the public's attention to his stand on automation to get sympathy for his GAW drive, or (2) he's bypassing automation as a weapon for this year's talks, hopes a Congressional investigation will turn up some real ammunition for him by next year's bargaining.

Grinding 5-Start Worm with 4" Lead

STANDARD STYLE 36 EX-CELL-O *Precision* THREAD GRINDER

In the photograph at the left the operator is grinding a worm shaft for use in a special machine. The part is about 22" long and the worm is 4½" long, 3.430" O.D., has 5 starts, a pitch of .800", a lead of 4" and a tooth depth of .5454". The worm was ground in two operations on a standard Style 36 Thread Grinder. It was rough ground from the solid, hardened, then finish ground.

For complete information and specifications on the Style 36 and other Ex-Cell-O Thread Grinders contact your local representative or write today to Ex-Cell-O.

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EX-CELL-O for PRECISION

THE MACHINE TOOL SHOW
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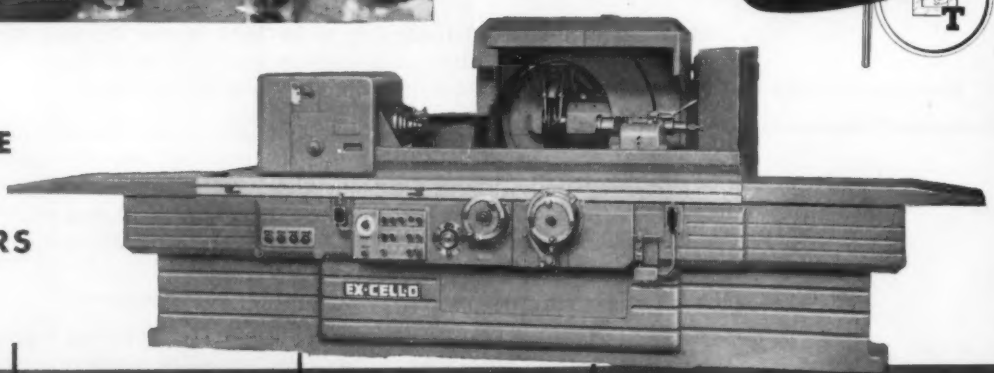
A COMPLETE LINE OF PRECISION THREAD GRINDERS



STYLE 50
Precision Thread Grinder—a versatile machine for external work, also available with internal attachment.

STYLE 33
Precision Thread Grinder—a high production machine for external work.

STYLE 39-A
Precision Thread Grinder—a high production machine for internal threads.

STYLE 36
Precision Thread Grinder—a versatile machine for extra long external threads, available with internal attachment.

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53-35

Washington . . .

Contract policy changes . . .

The Defense Dept is revising a procurement regulation spelling out costs that can be charged to the government in negotiation of cost-plus contracts.

Two provisions are being considered. One would allow certain contractors—mainly ones that do less than 25% of their business with the government—to charge the military for costs of basic or general research work. Another would ban firms who have a lot of government business from charging the military for costs of profit-sharing and stock-bonus plans.

Tanker trade-ins . . .

Washington's "trade-in" tanker scheme seems to be paying off. Maritime Administration has made its second deal with Cities Service Oil Co — the oil firm will turn in two old tankers for another new high-speed modern vessel. In the past five months, Maritime Administration has taken in nine tankers, allowing oil companies $16 million on new tankers worth $30 million. Maritime buys the old tanker and mothballs it; firms make their own deal with shipyards for new ships.

Green light for A-industry . . .

AEC has issued the long-awaited ground rules under which private industry can move into the atomic energy business. Firms who meet AEC's competence, equipment, and financial standards will get a license to start operations.

AEC will continue to own all atom fuel, leasing it out as needed. Private firms will be able to build nuclear power plants and operate them at a profit. What's more, they'll get 40-year licenses and guarantees of fuel to keep plants going.

Licenses will go for two main purposes: (1) research and development and (2) commercial or industrial use. Right now, most firms will want and get a license allowing them to study power reactor technology. AEC may subsidize some of these projects. Under the research and development category will be electric utilities, universities, equipment makers, medical institutions, or combines of interests who join together to get into the business.

A commercial or industrial license will restrict the company to construction and operation of a reactor for commercial production of power or some other specific industrial purpose.

Actually, the first business to qualify for a commercial license might be a "fuel element fabricator" — a firm that packages uranium or plutonium in a form useable in different kinds of reactors.

For example, Babcock and Wilcox, heavy electrical equipment makers, plan to do this. Atomic experts say that "anyone with good machine shop experience can learn to fabricate fuel elements."

Manufacturing census . . .

Government's 1954 Census of Manufacturers is just about finished. Census Bureau plans to have complete breakdown on information in less than half the time required for any previous census of this size. The new census will incorporate most of the recent proposals from advisory committees of industry statistical experts.

Main one is for better labeling of Census tabulations. For one thing, the Census Bureau plans to tote up statistics separately for so-called "captive" operations.

In the past, the Census showed "total production of this product" and "total production by this industry." Now there will be additional columns showing output by other industries producing significant quantities of the production, including identification and cross references.

A full-scale rewriting of textual descriptions is also under way. Each industry report will give a clearer explanation of the degree of coverage and the characteristics of the industry.

Mechanization and the CIO . . .

The first of labor's salvos on increasing industry mechanization—a CIO conference on "automation," held in Washington this month—shows there is still a fundamental split in union ranks over the subject. While some leaders "welcome" mechanization and ask joint study of resulting economic and social problems, others are not yet ready to admit that it is inevitable in many fields.

Automation is becoming the whipping boy, though loss of jobs — and thus, of union members — is presently more a result of increased integration and mechanization — "Detroit Automation" — rather than "true" automation with its feedback controls.

Timing of the meeting was significant; it came just one week after the start of guaranteed annual wage negotiations with Ford and GM in Detroit. The juxtaposition serves notice that as an industry installs new mechanical equipment, it can expect union demands for wage guarantees covering not only the workers employed in the new setup but those who may be laid off. Union leaders, too, served notice that companies should figure retraining costs and severance pay as a normal part of changeover costs.

Real fear in the minds of union leaders who accept automation's inevitability is that labor costs saved won't be passed on as productivity wage boosts, but will be used to increase the economics of "big business," relative to unions.

Thus, you can expect a strong push for study of "automation" by some Congressional committee.

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Detroit . . .

Who's afraid of the big bad strike?

Interested industrialists outside the auto industry (suppliers, machine tool builders) are almost unanimous in a belief that, GAW or no, there won't be a major auto strike this year.

Nobody has a concrete reason for this belief — it's just a universal feeling. Most likely reasoning is that a compromise will be achieved because competitive pressures today are so strong neither Ford nor GM can afford a shutdown. Whether or not this is true remains to be seen, but it's significant that few suppliers are "running scared."

A shuffling of feet . . .

Little really newsworthy comment was forthcoming from either side of the bargaining table at press time —unless you count the customary "sweetness and light" observations to the effect that everyone is working toward an amiable settlement.

Ford had this to say: "We are fully aware of the enormous importance to the American public of these negotiations . . . In the interests of eliminating any possible misunderstandings, we will follow a policy of confining Ford's views . . . to the conference room . . . Until and unless there occur important developments that dictate otherwise, which is a contingency we don't presently foresee."

That last sentence, some Detroiters think, could mean that Ford may see its way clear to grant something in the way of GAW, since GAW is obviously not a contingency Ford doesn't "presently foresee."

Said a UAW spokesman: "Rumors keep cropping up that UAW intends to strike either Ford or General Motors . . . nothing could be farther from the truth . . . We are, however, prepared for that eventuality if we are forced into it as a result of fruitless negotiations."

High-sounding words on both sides. Translation: "no comment yet."

Perhaps the most pertinent comment summing up automakers' objections to GAW was made some seven years ago by GM's then-executive vice president. Testifying before a Senate subcommittee, he said:

"If we set out on a basis of a million cars a year, it does not necessarily mean we would produce 83,333 cars a month . . . Reason is that there are certain winter months when the public doesn't want any new cars, or few . . . But in the peak selling season in the spring (the public buys) 120,000 cars a month. If we are going to make a million cars, we must be prepared to make 6000 cars a day in a 20-day month, five-day week to establish 120,000 cars a month. Any month in which we make fewer than 120,000 cars, any day we make fewer than 6000, we have some idle capacity.

"That is part of the overall hazards of the business. Sometimes we have too much idle capacity for too long a period of time."

Sum that up, it means the auto industry can't regulate the public's buying habits, and it can't store cars.

A reporter at the recent UAW convention in Cleveland had what is perhaps the last word on GAW. Watching UAW's delegates approve a dues raise to $7.50 a month to build up a $25-million strike fund, he observed: "They don't have to go after the auto companies for GAW — they could finance it out of the strike fund."

UAW's lever — long-term contracts . . .

GM spoke out in full-page newspaper ads, citing the gains of auto workers over the life of GM's five-year contract.

This contract duration is probably UAW's greatest bargaining lever. The union knows full well how anxious the industry is to sign long-term contracts again. Hence, UAW's statements that it wants no contracts to run over two years.

It's an easily compromised point, from UAW's standpoint — all GM or Ford has to do to win another five-year contract is agree to a GAW plan.

Automation: no stumbling block . . .

Automation isn't likely to be a stumbling block in the negotiations. Reuther's blasts anent automation were largely issued for the record.

One factor not generally discussed in connection with UAW's remarks about automation is this: Increasing use of automated processes means long-term gains for certain unions, but not so much for UAW. IAM and the CIO Electrical Workers stand to gain most as automation increases, because union members are more concerned with production, rather than use, of automated machinery.

UAW on the other hand has its memberships centered in plants that would make greatest use of automated machinery. Thus, UAW leadership, taking a long look ahead, doubtless can see where its membership may tend to stand still, whereas IAM, IUE and other unions can be expected to grow under the impetus of automation.

Keep an eye on Ford . . .

There'll be another major executive reshuffle there soon. And watch for a Lincoln-Mercury split. Booming Mercury is expected to go it alone, while not-so-booming Lincoln will become part of Ford's Continental Division. The fabulous $10,000 Continental should be ready in September. See Field Report USA-Detroit, p165.

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Machine Tools . . .

ODM components program still alive . . .

It turns out that the components program of the Office of Defense Mobilization is far from being dead, though ODM's own Borrowing Authority Review Board refused to give it the green light.

The review board, it is pointed out, is strictly advisory. ODM administrator Flemming can ignore its recommendations if he chooses. He, in fact, has ample authority to spend the money for the components program if he wants to.

Mr Flemming decided, under the circumstances, to go ahead with the turbine project but first to get the backing of the Joint Congressional Committee on Defense Production. He believed this to be the wise course, after his own advisory board had overruled the favorable action taken by the Vance Committee, another of his advisory groups.

There is another reason for the request to the Joint Congressional Committee. Purchase of machine tools for standby purposes is a brand-new project for ODM. None of the $2.1 billion Defense Production Borrowing Authority has ever thus been used.

Program Given Cordial Reception . . .

Accordingly, Mr Flemming appeared before the Joint Committee on April 15 and is reported to have been given a cordial reception. At least no committee member expressed opposition or was even critical. The assumption is that Mr Flemming was encouraged to proceed.

If Mr Fleming now presses for the turbine program, as he indicates, his action does not mean that the tools involved are near the ordering stage. Some reappraisals of requirements are said to be the next step. Altogether, any business stemming from the program will not get into the hands of machine tool builders for some months.

You will remember that the proposal is to spend some $62 million to expand turbine capacity by one-third in preparation for a possible M-Day. About $55 million of the $62 million would go for machine tools.

Under the turbine-capacity proposals, General Services Administration would buy the machine tools —mostly 200-in gear hobbing machines and other large machines that take a long time to build. The machines would be installed in the plants of 11 companies producing turbines. Government would pay the firms to maintain these machines.

Mr Flemming's aggressiveness on behalf of the turbine project was inspired by his knowledge of the disastrous effect that its death would have on many other components programs to which months of study, involving sizable expenditures, had been devoted. If it should be killed, the other studies would automatically die with it.

Elephant program in danger . . .

The so-called elephant machine tool program would suffer the same fate as the turbine program if the latter was allowed to die.

Calling for some $40 million of elephant tools to be stockpiled, the elephant program is dependent upon the same government fund (Defense Production Borrowing Authority) as the components program. The money thus used would be frozen. And ODM legal counsel frowns on such use.

Field surveys made by BDSA, to find out how much of a shortage of elephant tools there would be on M-Day, turned up some pretty startling figures.

The original estimate of $40 million as financing the building of machines to eliminate the shortage was proved greatly inadequate. Around $125 million might be nearer the mark.

BDSA surveys machine deficiencies . . .

BDSA has been in the midst of a study that goes much farther than determining needs for elephant tools. It has been trying to find out the deficiency in all kinds of machine tools, come M-Day.

The results already turned up are impressive. If reserve machines should be built to make up the deficiency, and thereby speed manufacture of war materiel in an emergency, more than $1 billion in government funds would be required.

A special appropriation by Congress would be about the only way in which the money could be secured for such a reserve program.

That is why the program is not expected to get beyond the talking stage at this time. But it serves the useful purpose of acquainting the higher Washington echelon with the situation.

Penn-Texas wins Niles-Bement-Pond control . . .

Niles-Bement-Pond Co, West Hartford, Conn, came under control of the Penn-Texas interests at the annual meeting early this month.

Leopold D Silberstein, Penn-Texas chairman, has been elected president and chairman of N-B-P.

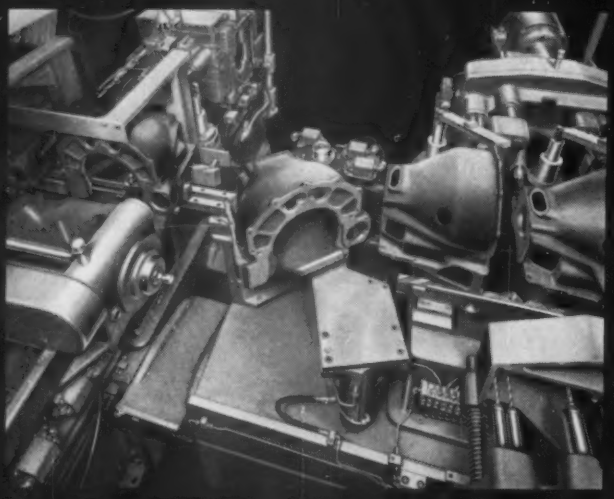
Alexander H d'Arcambal has been named senior vice president of N-B-P and president of the Pratt & Whitney Division and of the Chandler-Evans Division.

Richard W Banfield has become executive vice president of the Pratt & Whitney Division and vice president of N-B-P.

Seymour M Heilbron, Penn-Texas secretary, has become secretary of N-B-P. Ernest Stroheim, financial vice president of Penn-Texas, is now an N-B-P vice president.

BF

SNYDER–AUTOMATION



At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

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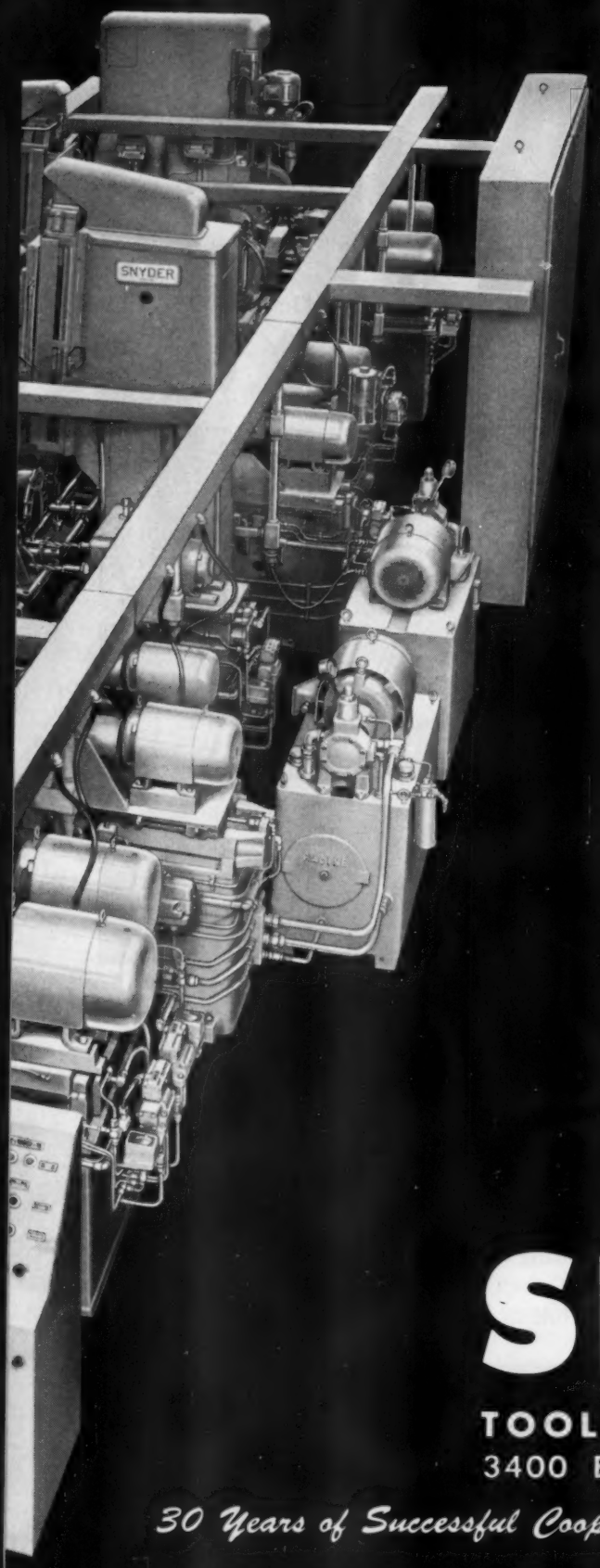

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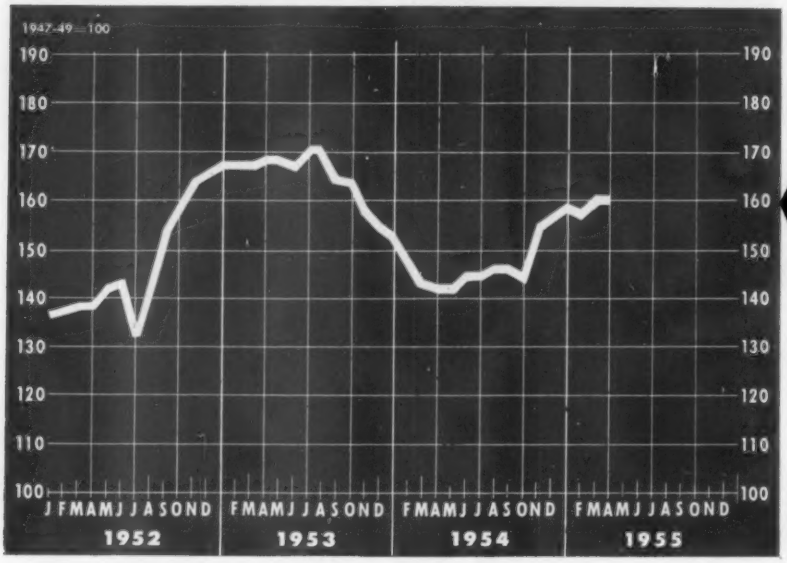

160

Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	APR '55(*)	MAR '55(p)	FEB '54(r)	MAR '54
Total index..	**160**	**159**	**157**	**147**
Machinery	**127**	**125**	**126**	
Electrical Machinery	**186**	**187**	**163**	
Autos	**160**	**152**	**116**	
Other Transportation	**270**	**273**	**267**	
Other Metalworking	**130**	**129**	**123**	

(*) Estimated (p) preliminary (r) revised

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

Second quarter output to match first . . .

It is a safe bet that metalworking production in the second quarter will match that in the first quarter. And the first quarter was one of the best on record.

Take household appliances. Frigidaire's retail sales in the January-March period were 25% ahead of the previous year. This trend is expected to continue and should result in a 25% increase for the entire year, General Motors president Harlow Curtice says. Norge report its appliance sales topped any other quarter in history. They were 2½ times the same period in 1954.

A O Smith attained a new high in domestic water heater sales in March. Motorola recently has received more orders for automobile and portable radios from dealers than ever before.

One TV set maker states that first-quarter sales were 35% greater than in the same period a year ago.

Automobile success story . . .

The same success story holds in automobiles. Record-breaking sales of 1.9 million cars were made in the first 90 days this year.

All five General Motors car divisions set new sales records, delivering almost 900,000 cars. Meanwhile GM used car sales were over 1.1 million.

Ford car and truck output the first quarter totaled 540,000 units, biggest in history. Chrysler broke all first quarter records with assemblies of 44,000 Chryslers and Imperials.

Prosperity is widespread in Metalworking . . .

Prosperity in Metalworking is not confined to automobiles and household appliances, but is widespread throughout all kinds of consumer goods.

It also extends into durable goods. The new orders index of industrial supplies and machinery has continued to climb. No figures are at hand beyond February, but in that month the index got to its highest point in 22 months. It was the fourth consecutive month during which the index had risen. The index is compiled by the American Supply and Machinery Manufacturers' Association. In February it was at 175.1, with July, 1948, as the base month.

Steel mills are loaded with orders through the first half. Some are booked well into the third quarter.

It is a good guess that the prospect of a price rise by midsummer or early fall is helping to drive in business from steel users.

Some small makers of major household appliances are cutting back on sheet steel deliveries. But the large manufacturers still are taking all that they have ordered — and that is plenty.

Almost all steel items except alloys and other specialties are in demand. Pressure for steel has become so great that rumors have floated around about revival of so-called conversion deals that were so popular after World War II and after Korea.

Tool and die shops are fairly busy. Work shipped to customers has increased, but still is almost 20% below the dollar volume in the first quarter of '54, National Tool and Die Manufacturers Association says.

Net orders have been running ahead of those last year. Employment is down, reflecting a decline in overtime worked.

Nearly half the shop owners reporting to NTDMA in January that the outlook was poor have changed their predictions to good. In fact, only 6% of the shops anticipate poor business. Makers of home appliances and electronic controls have been the most active buyers lately.

Gaging Business . . .

Price Index

	APR '55(*)	MAR '55(p)	FEB '54(r)	MAR '54
Total Index	**134.5**	**134.3**	**134.2**	**132.8**
Metalworking Machinery	**146.1**	**145.9**		**142.0**
Other Machinery exc. Electrical	**139.0**	**138.8**		**137.6**
Electrical Machinery	**131.9**	**131.9**		**132.0**
Fabricated Metal Products	**130.5**	**130.5**		**129.0**

(*) Estimated (p) preliminary (r) revised

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

New peak in business and industry . . .

Business in the first quarter was the best for that period in history. All the figures are not yet in, but enough are available to establish that fact.

What's more, the lush activity in the first three months of the year is continuing uninterruptedly through April. And May looms promisingly.

Industrial production (manufacturing and mining) is currently running 10% ahead of a year ago, the Federal Reserve index shows. The index, in case you are interested, is at an all-time high.

The gross national product, which is the value of all the goods and services produced in the nation, also is at a new peak. GNP is at an annual rate of more than $370 billion right now. The previous high spot was reached in the second quarter of 1953.

Employment expands . . .

It is hard to find any index that reflects other than a great swell of prosperity. Civilian employment rose by half a million in March. It is continuing to gain in April. Last month, employment totaled 60.5 million. Expansion in factory employment, agriculture and construction contributed to the rise.

Every manufacturing industry except tobacco and ordnance reported increased work forces in March.

Personal income is very high . . .

Personal income jumped to an annual rate of $292.5 billion in February. March and April figures will be even higher.

Income increased $1 billion in February after allowance was made for seasonal factors. It was $7.5 billion above a year ago. The gain came from a longer work-week and more employment.

Increased income was reported in the durable goods industries—metals, machinery, transportation equipment.

Inventories in the hands of manufacturers have not varied much over-all lately. Durable goods makers added to their stocks in February. Others, mainly chemical and petroleum companies, cut them down.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	140.3	140.9	120.8
Steel ingot production (thousand tons)	2,292	2,300	1,622
Electric power output (million Kilowatt hours)	9,633	9,804	8,345
Production of automobiles and trucks	207,107	218,437	152,074
Engineering construction awards (*Eng. News-Record*, millions)	$272.7	$335.0	$306.6

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	382	229	344
Vacuum cleaners sales (thousands of units)	250	217	221
Washers sales (thousands of units)	357	265	250
Household electric ranges sales (thousands of units)	137	85	102
Radio production (thousands of units)	1,068	1,262	872
Television production (thousands of units)	655	833	421
Gear sales index (1947-49 = 100)	140.2	182.2	167.4
Foundry equipment new orders index (shipments, 1947-49 = 100)	81.0	113.9	173.8

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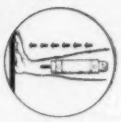

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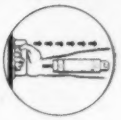

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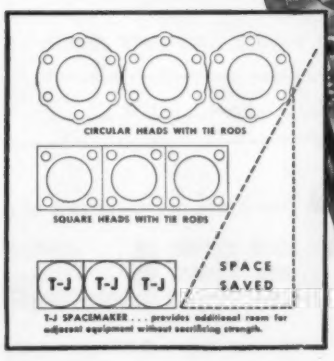
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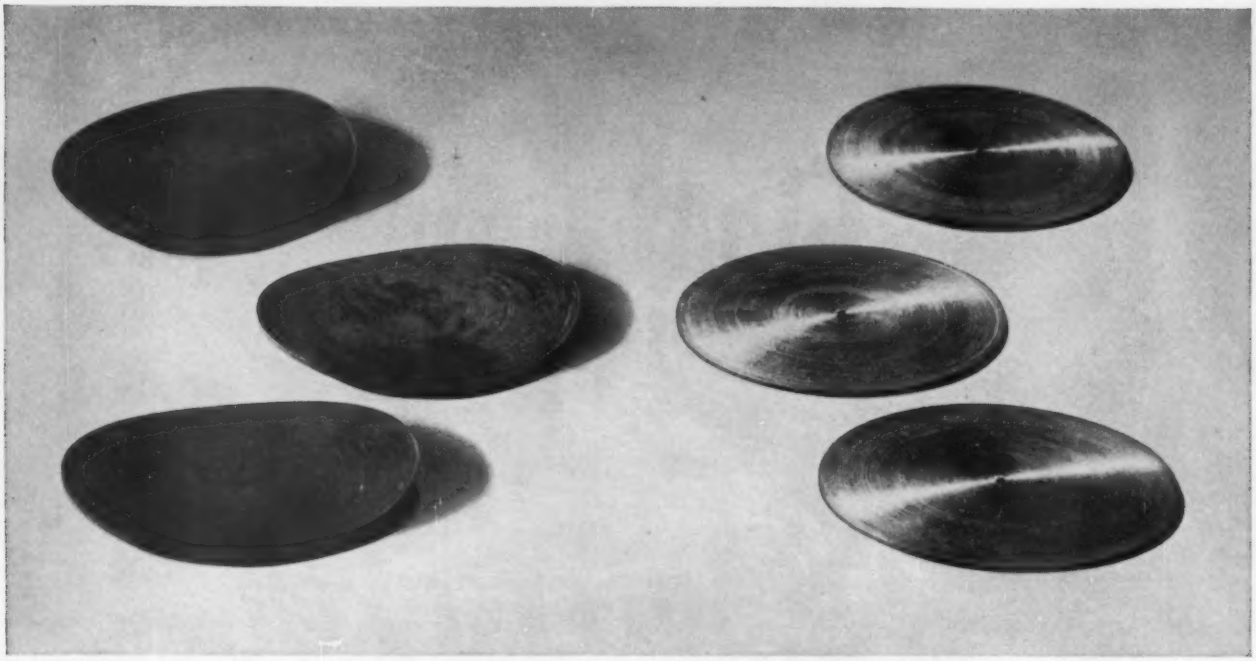

Why Armco **17-4 PH** Stainless Steel **cures distortion problems**

Here's how Armco 17-4 PH Stainless Steel and standard hardenable stainless steel reacted to heat treatment. The three samples at left are all Type 431 stainless steel; the ones at the right are Armco 17-4 PH. Both sets of discs are of the same dimensions, cut from 1¼" diameter bar stock. All have been heat treated to Rockwell C-40 to C-41.

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And then those fringe benefits are bothering you. They are growing in number. Each year they amount to more cents per hour.

You've got to do something to get more and better production out of your men if you are to pay them more. There is only one way to do it: Put more machine power into your shop.

But that isn't the whole story. You find that competition for business is much tougher. Your customers are making you use a sharper pencil in figuring prices.

Your margin is less. You are bound to think about how nice it would be to cut shop costs and to turn out a better product to get the business. And that inevitably involves some new machines.

But how do you know, for sure, what machines should be replaced? You don't have to guess any longer. You can do a little figuring on your own of the pluses and minuses.

You can apply the MAPI formula as a yardstick, or a modification of it. If this formula scares you because you think it too highbrow, there are other simpler measures to find out what you can save by replacing the old machines with new ones.

Don't overlook the fact that Uncle Sam now allows you to write off your investment in new machines much faster than he used to. You can depreciate your machines by the double declining balance method and thus get back two-thirds of your capital outlay in about five years. That is half the time it formerly took.

If you prefer, you can resort to the sum-of-the-digits method. This is a fancy name for a very simple method of writing off your machines even more quickly than by the double declining balance method.

So you no longer have the excuse that it is going to take you 15 to 20 years to get your money back on the new machines that you order.

It looks good, you say. It all makes sense, except for one pretty important thing. You just don't have the cash.

But your credit is good, isn't it? You can buy those new machines on time, paying down only 20% and taking five years to get out from under. Pay as you depreciate, if you wish. There is not much strain then.

Perhaps you don't want to obligate yourself for a capital outlay at all. You still can acquire the new machines. You can lease them and charge the rental against current operating expenses.

To repeat, the point is simply this: **Never before have there been so many inducements as now to modernize your shop practices, lower your costs and improve the quality of your product. Within your reach is a machine performance that only a few years back was unattainable.**

So, what are you waiting for?

Burnham Finney

72 HOLES

Photos courtesy Kirk & Blum, Cincinnati, Ohio

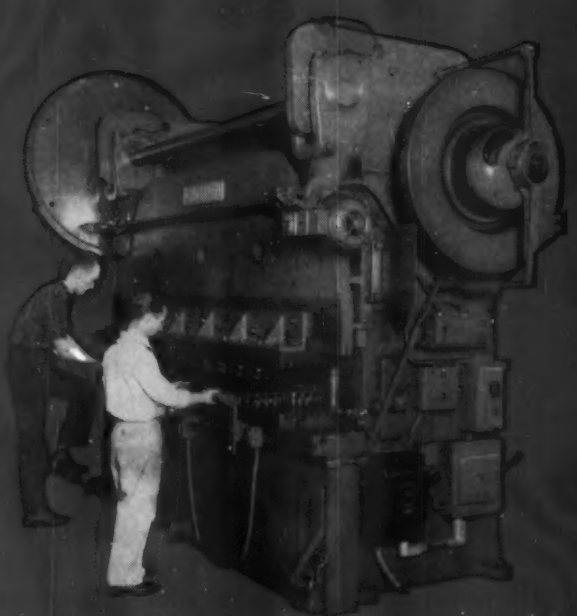
where they belong

Economical assembly depended on maintaining the accurate spacing of these 72 holes and their accurate positioning on this 10-gauge sheet.

This Cincinnati Press Brake is giving a high production at low cost by its speed and accuracy of performance, which insures rapid low cost assembly.

As a press, they offer high production with low investment. As a Press Brake, their low set-up costs, quick change-overs and versatility bring profits.

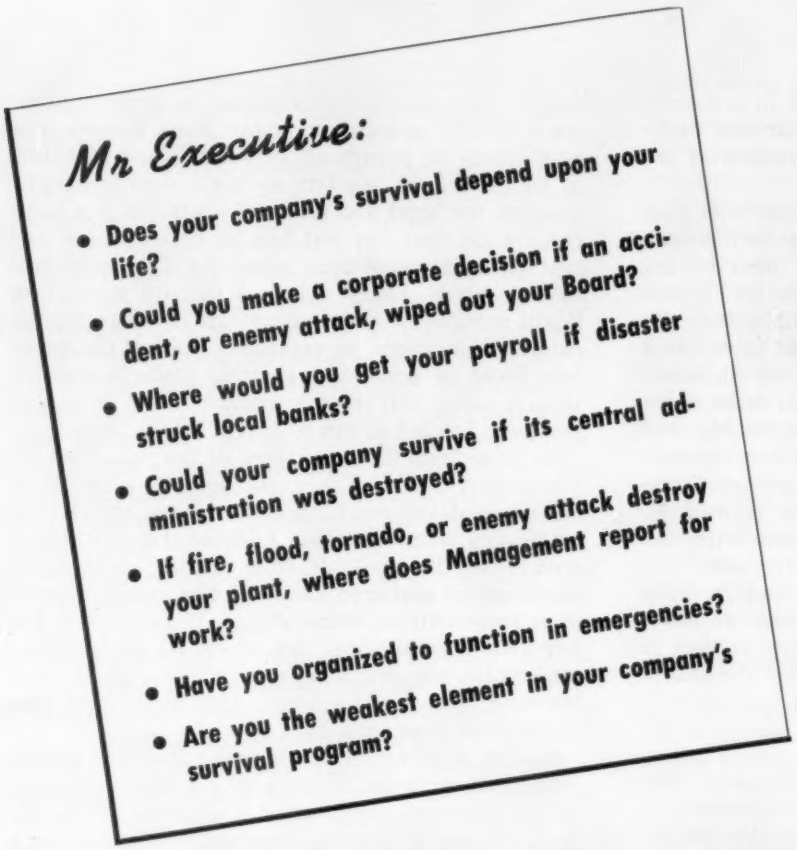
Write for Catalog B-4 where many examples of the versatility of Cincinnati Press Brakes are illustrated.



CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES


Mr Executive:
• Does your company's survival depend upon your life?
• Could you make a corporate decision if an accident, or enemy attack, wiped out your Board?
• Where would you get your payroll if disaster struck local banks?
• Could your company survive if its central administration was destroyed?
• If fire, flood, tornado, or enemy attack destroy your plant, where does Management report for work?
• Have you organized to function in emergencies?
• Are you the weakest element in your company's survival program?

American Machinist

EXECUTIVE VULNERABILITY

threatens management continuity

Disaster control measures for the protection of production facilities, physical assets, and personnel have been widely publicized. Management continuity is equally important to survival, especially in large organizations. Yet very little has been said about the many complex problems that must be solved before disaster strikes to insure that business, social, and *legal* requirements are fulfilled during emergency operation. Even if you plan to procrastinate your planning, *read this now* so that you will know what you should have done when it is too late for comfort.

WILLIAM M STOCKER, JR, associate editor

Sound leadership is most valuable in times of emergency — when success or failure must rely on instant judgment, previous experience, and unswerving responsibility. Natural or man-caused disasters have often left machine tools and other industrial equipment without major damage, while simultaneously inflicting heavy damage on personnel, buildings, and records. Thus, when leadership is most essential, who can say that the recognized leaders of an organization will be capable of leading?

As I look out of the window and across town to the Empire State Building, I wonder, "If New York City suffered nuclear attack, how many vast and far-flung companies, companies essential to our defense, would be in a leaderless turmoil for lack of official decisions—and how much of the first, critical, 24-hr afterward would be lost in regaining control?"

Similarly, in towns and cities across the nation, fires, floods, hurricanes, or enemy attacks could either put the recognized business leaders out of action or prevent them from communicating with their companies. Who will give instructions, make decisions, authorize expenditures? It is vital for every industrial organization to plan now for management continuity.

Management can avoid the problem of confused leadership to a considerable extent by devoloping an "emergency executive-succession list." It would describe the emergency functions of surviving suc-

cessors and would list these personnel in sequence. Thus, in an emergency, the available survivor highest on the list assumes temporary direction of the organization.

For larger, decentralized organizations, this plan can be developed for executives within each autonomous unit. The separate lists can then be integrated with the main Headquarters list. Under major disaster conditions, it is possible that the management of a parent company might be replaced by various surviving top executives of dispersed affiliated or subsidiary companies. Thus there never is any doubt as to the source of leadership and there is little cause for arguments to develop over who has authority. This list can be prepared and kept confiidential until such time as it may be needed, or it can be openly discussed with the executives involved. Companies using such lists claim that when succession is fairly and logically determined, there is no sign of jealousy or envy. After all, the assignments are temporary, subject to the emergency condition, and based upon the ability to quickly take over an empty position.

WHO TAKES OVER?

For example, an executive vice-president who spends most of his time on the road is not necessarily the logical *emergency* successor, even though he may be the logical successor under normal conditions, if the president becomes a casualty. Someone who is likely to be in the plant at all times and is familiar with day-to-day internal operations might be a much better choice. Thus, it is important to understand that the emergency succession list is not always exactly the same as the normal "chain of command." The two are based upon different factors and different sets of conditions. If you are fortunate enough to have a company with two or more decentralized plants, it is extremely valuable to set up an executive exchange program to familiarize the executives of each plant with the other plants. An emergency management team can be sent from one plant to another on short notice.

Executive vulnerability is a primary factor in planning succession. In other words, there is little merit to making the next-door neighbor to an executive his successor simply because they are neighbors, they are friends, and they have similar specialties. If disaster strikes while they are both at home, both may be victims and the plan fails. Appraise both the geographic and the volume concentration of your executives. A high percentage of them may be in one area—either business area or a desirable residential area, but it may not be a critical target area. Conversely, all of your executives may be widely dispersed, but with many or all of their individual locations in critical target areas. Select successors, if possible, who reside at some distance from each other yet who can reach the plant or emergency reporting center.

In normal practice, avoid allowing all of your top management, or all of any management level for that matter, traveling together. At least insist that they do not use the same car, plane, train, boat, bus or other transportation means at the same time. As a further precaution, many large corporations now refuse to permit all of their Board Members to be present in one city or town simultaneously. Imagine the legal and financial problems of a large corporation that has just lost its entire Board and you will understand their reasoning. The problem is simply solved. Every month a definite number of Board members tours the corporate holdings, studies external operations, or vacations. If all of the members must be present, a meeting place is selected that is safely out of any critical target area and members are asked not to travel in one body.

In some firms there are three or four qualified replacements for each key position, as a result of executive development programs and confidential emergency manning tables. Additional qualified personnel may be available from similar organization structures at scattered locations. Organization depth is as important as vulnerability. If your plant has key executive positions for which no qualified replacements are available, now is the time to start teaching someone the ropes. Indispensability was never more dangerous than today.

Boards of Directors should make provision for the conduct of corporate business with a minimum number of members constituting a quorum. While the legal number of directors necessary to constitute a quorum will vary from state to state, plans should be made to permit corporate decisions under emergency conditions. If you haven't done so already, discuss this problem with your legal staff. Enemy attack could necessitate some fast corporate action and major policy decisions—all at a time when Board members might be among the casualties, or unable to communicate with the other members.

As another preparedness step, one corporation has planned for the creation of supervisory teams chosen from employees at various distant plants. These teams will report immediately to an assigned plant in the event of a major disaster at that plant.

OPERATIONAL CONTINUITY

Management continuity cannot be fully effective unless steps are taken to provide continuation of the administrative operation as well. Thus, it is advisable to designate a specific location as *emergency or alternate company headquarters*. It should be furnished with the minimum equipment and facilities needed to permit effective operation of the reconstructed executive team.

One company suggests these criteria for selection of alternate company headquarters:

1) It must be outside of the critical target area.

2) The neighboring community must be large enough to provide facilities for adequate transportation, and housing for employees.

3) A desirable location is at a point where the company already has an operating installation. (This is questionable, depending upon actual location).

Some additional criteria include:

The location should be within reasonable traveling (commuting?) distance from the main head-

quarters; available from some nearby business center.

It should be possible to reach the emergency headquarters by public transportation.

Before selecting a location, consider these requirements: security, accessibility, communications, and accommodations. Construction, rental, or purchase of facilities may be involved.

Several companies have purchased and equipped emergency headquarters remotely located from, but convenient to, home offices in critical target areas. Senior management personnel have been assigned to carry on or reconstitute the business from these locations. As a test, actual full-staff operations have been carried on from these headquarters. One such facility has extensive sleeping quarters. Other installations are based on employees sleeping at nearby hotels. Most plans provide space and facilities for working and eating.

Efficient emergency administrative operation requires five key elements:

1 . . Communications
2 . . Availability of records
3 . . Living and operating facilities
4 . . Assigned personnel, with alternates
5 . . Available cash—financial freedom

However, the alternate company headquarters is intended only for key top executive personnel. It is neither large enough nor convenient enough to serve as office and home for the entire administrative staff. Also, many people prefer to stay near their own homes during emergency situations. Thus, additional emergency reporting points, called *Remote Reporting Centers*, provide rendezvous locations for other levels of designated key personnel. These centers are established at the homes of designated executive and supervisory personnel at company and plant level; are located according to the density of employee residence in each area. Locations are chosen with the foreknowledge that traffic movement may be regulated and that personnel may have to walk to the "centers." Various records are kept at these locations, with duplicate sets at all of the other reporting centers. Home phones are on a preference list, arranged with the telephone company, for continued service in an emergency. Every employee is given an identification card that tells him where to report in an emergency, as well as lists all of the centers, their addresses, and their telephone numbers. Wherever possible, homes selected for remote reporting centers are owned by employees who have no immediate intention of moving. Each center maintains an up-to-date file of cards which describes every employee in the company operation in that area. Thus, though each employee is assigned to a reporting center, any employee can report to any center in an emergency. Two cards are used. One card is indexed alphabetically by the employee's name and the other card is indexed by job classification. The latter includes primary and secondary skills. If disaster strikes, confusion is minimized and reorganization is speeded because replacements can be located and regrouped where needed by simply referring to the job classification file and calling other reporting centers.

PROTECTION OF RECORDS

Certain records in every company are essential to continued operation. Their destruction could result in:

1. Slowing or stopping production
2. Impeding financial and/or physical rehabilitation
3. Complicated dealings with suppliers and customers
4. Harm to employee and stockholder interests

Many protection systems are available. One method is to set up company security storage vaults at safe distances from the normal operating center. Important records can be Microfilmed and stored in these vaults. In addition to Microfilming, one company makes extra copies of important business transactions and delivers them, at the close of business each day, to short-term storage at its alternate company headquarters, where a small maintenance staff handles the filing.

PROTECTION OF CURRENT ASSETS

If disaster disrupts normal banking and financial services, the resulting monetary shortages could create serious problems. (Remember the bank "holidays.") Consider these factors:

1. Cash —appraise:
   Advantages of maintaining bank accounts of an unrestricted nature at scattered locations
   Advantages of establishing lines of credit at scattered locations
2. U S Govt and marketable securities—appraise:
   Adequacy of custodian's procedures
   Records
   Storage place
3. Inventories — appraise:
   Size and character, plus safety of records
   Practicability of dispersion or subdivision
   Adequacy of storage relative to inherent hazards
4. Accounts receivable — appraise:
   Safeguarding of records

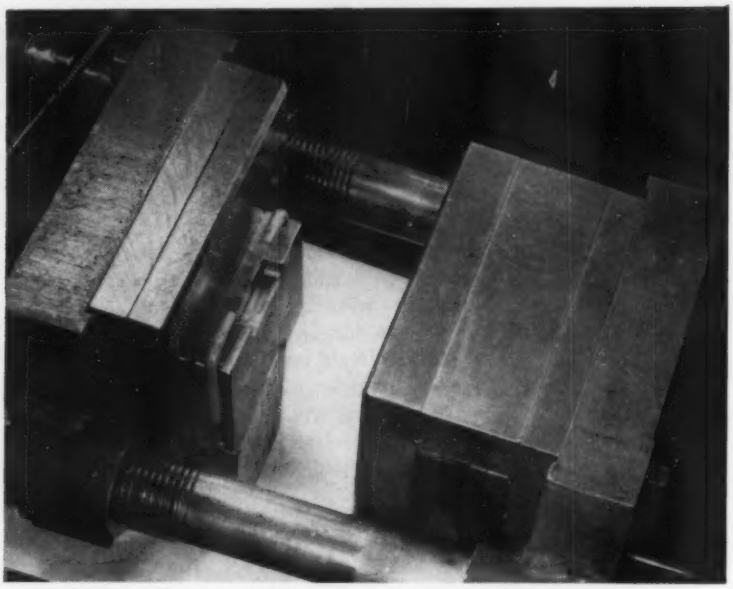
EMERGENCY FINANCES

Under post-disaster conditions money may be needed promptly, yet normal company accounting procedures may be badly disrupted. Where will you get cash — for wage payments, for advances to employees, for payment of bills, for medicine, food or equipment? Who will authorize payment?

One company has simplified the problem by preparing checks, drawn on out-of-town banks, in unit sums of $25, $50, $100, and $500 and signed by the Treasurer. To cash one of these checks it is only necessary to fill in the name of the payee *and* have it countersigned by one of 100 or more people whose names are listed on the Organization Disaster Plan. Both a copy of the plan and the checks are kept in the Company Security Storage Vault. Under very serious emergencies, it might be advisable to have a supply of actual cash. This, too, can be kept at the storage vault—with instructions for use in the Disaster Plan.

Soft dies mold short-run plastics

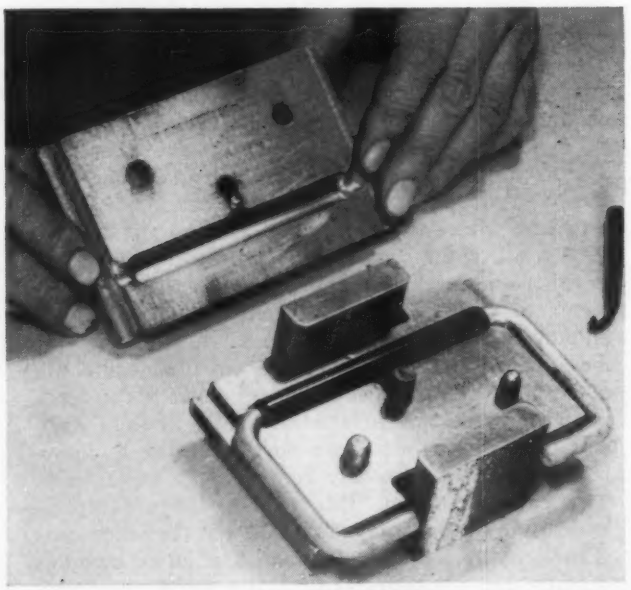
WILLIAM GIRDNER, tool engineer,
HEWLETT-PACKARD CO,
PALO ALTO, CALIF



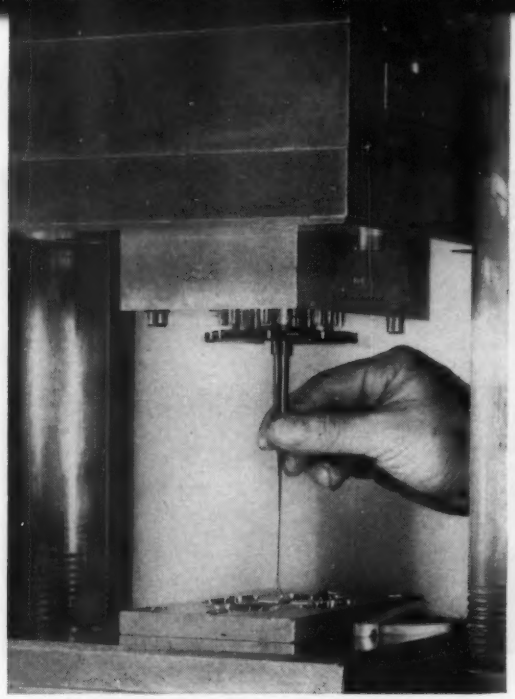
TWO SHOTS PER MINUTE is rate on hand-operated 1-oz Van Dorn injection press when plastic parts are molded in short runs (50-500 pc). For large runs, a 4- to 6-oz Impco press is used. Crude wooden jig supports soft steel die; two infrared lamps adjusted by operator keep die temperature at 170F when thermoplastic materials are molded

A company that makes more than 250 different kinds of electronic instruments got into plastics molding because costs of parts bought outside was too high. Hewlett-Packard now has about 150 dies, all stored in a cabinet heated to 120-140F to prevent rust, and runs about 100,000 parts per year. Most important, to keep tooling costs low, are designers, toolmakers, and press operators of high skill

SKILLED OPERATOR KNOCKS OUT PART against jig. Projecting steel rod is part of transit case handle, around which Tenite II sleeve is molded. Short runs are mainly hand work, requiring experienced operators with plenty of shop tricks to keep up with rate

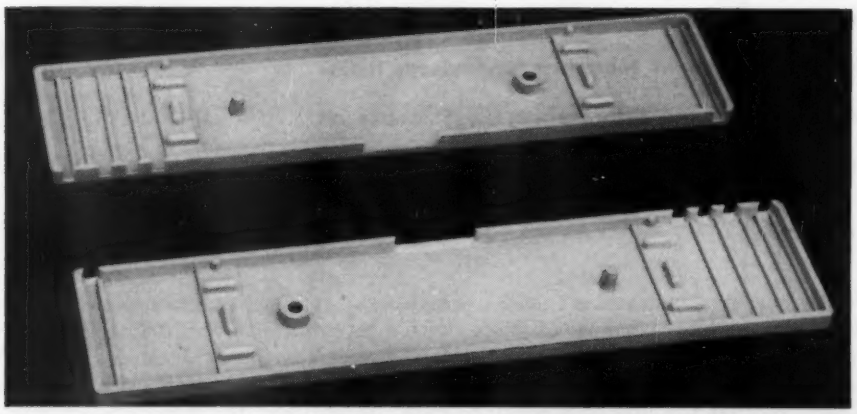


DIE IS SIMPLICITY ITSELF; cost only $25. Part was purchased earlier for 14¢, now costs 7¢. Soft die steel can last for 100,000 pc, is easy to repair and correct. Some dies have taken only 48 hr to make. All small dies fit on standard bases (one per press) in a modular system

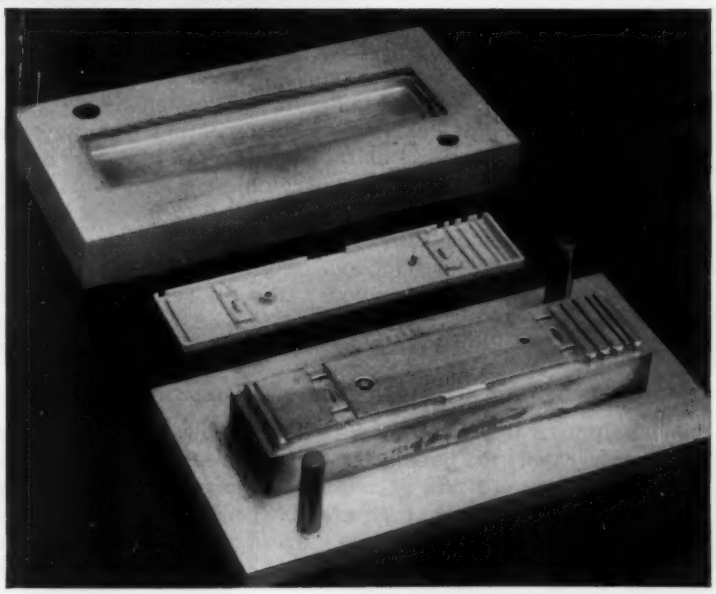


POLYSTYRENE INSULATORS ARE MOLDED in four-cavity die mounted on standard base and containing ejector pins. Parts are removed manually, still cost only 5¢—purchase price would be 17½¢. Changeover time on presses is slashed by having interchangeable injection cylinders for each plastic, so purging is not required between jobs

DIE ASSEMBLY for two-hole binding-post insulators cost $150; an outside bid was for $500. With reorders, die has produced 100,000 parts and required only a single two-hr cleaning and polishing



"PENCIL-CASE" HOUSINGS for delay line are thermosetting alkyd, compression-molded in dies clamped to platens heated to 300F by electric elements. Air powered, solenoid control closes press in 2 to 4 sec because alkyd cures rapidly. Slower plastics are preheated in $125 infrared shop-built oven



DIES FOR THERMOSETTING PLASTICS are hardened. Compression press is nominally for volume runs, but changeover takes only 30 min if press is warm. Lots as small as 500 pc are run. This die cost $208, part costs 25¢; purchased part would be 75¢

HOW TO ACHIEVE OBJECTIVES in line management is told top management at Jack & Heintz by a team member from the line-supervision group. Presentation was originally presented to his own group, discussed, revised and offered mid-management for criticism and approval before reaching the top. Unique feature of Management Job Program is that it sets up a management policy-making program at the line-supervision level—takes it up to top management level instead of reverse

New management-development program

A unique approach to the problem of developing supervisory personnel and building an integrated 3-level management team has supervisors training themselves, defining their own jobs, and determining best means of reaching their individual and combined objectives. Here's the story

GEORGE H DE GROAT, associate editor

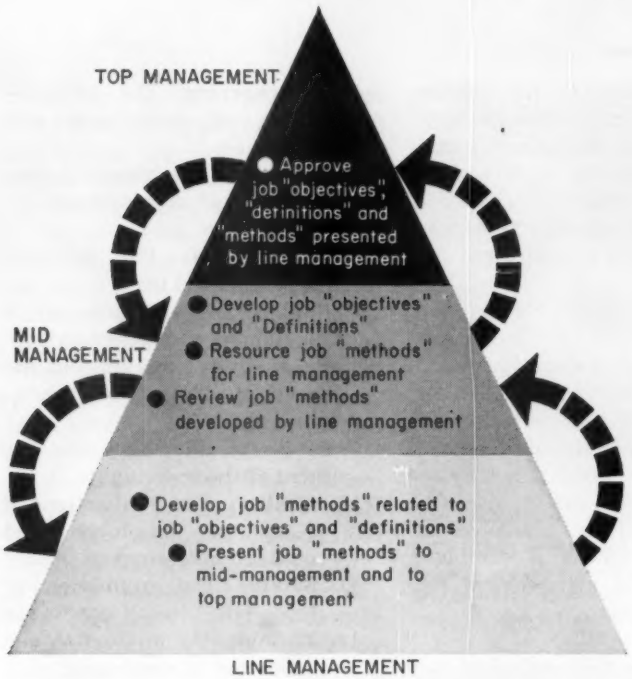
A new management-development technique, adjusted to the particular needs of Jack & Heintz, Inc, has no formal training program. Instead, it makes use of individual initiative, self-reliance, and enthusiasm to teach supervisory personnel the management job of making and carrying out sound decisions. The management problem here is especially complex because of the nature of the business — contract jobbing parts for the fast-changing aircraft industry. Quantities run from ten to a few thousand and there is little opportunity to tool up for long runs or the production of a standard product uninterrupted by changes or modifications.

All levels of management must be closely coordinated and carefully integrated to handle efficiently the manufacture of more than a hundred different products that require approximately 20,000 separate machining and assembly operations and which change or become obsolete with improvements and new developments in aircraft manufacture. The company is thus in a constant race against obsolescence. Products designed and built to specifications are often obsolete as little as six months after conception, thereby necessitating considerable design change to keep up to date. To cope with constantly shifting situations and to be able to place proper emphasis on the right things at the right time, Jack & Heintz has a plan to achieve a flexible, well-informed, and alert management team.

MANAGEMENT JOB DEFINED

One big step in the plan was to set up an organizational approach to the management job. With the help of George Kenning, Rutherford, NJ, personnel consultant, who devotes two days a week to the plant, a program was initiated to emphasize and define the management job *at Jack & Heintz*. A workable definition, which clearly establishes the functions of management at all levels, could not be developed by an individual alone or even a small group. The answer to the question, "What is the job of line supervision?" could only be answered by the organization whose function it defines—the entire management body. As a result, the plant, referred to as the Management Job Program, follows and integrates the present management structure of three supervisory levels—line, mid, and top management.

Line management includes 85 supervisors in charge of plant departments, mid-management covers 17 supervisors in charge of larger sub-divisions of major departments, and top management, 7 heads of major departments and


TOP MANAGEMENT
Approve job "objectives", "definitions" and "methods" presented by line management
MID MANAGEMENT
Develop job "objectives" and "Definitions"
Resource job "methods" for line management
Review job "methods" developed by line management
Develop job "methods" related to job "objectives" and "definitions"
Present job "methods" to mid-management and to top management
LINE MANAGEMENT

THREE-LEVEL MANAGEMENT is inter-related by organizational approach to the management job. Mid-management, in charge of large subdivisions of major departments, defines management objectives and assigns them to teams of supervisors in charge of plant departments (line management), to develop methods of achieving them. Line management presents the methods after they are developed to mid-management for comment and approval before final presentation to top management. Thus all levels of management work together to define, establish and perform the management job

STEP-BY-STEP OUTLINE of program procedure is shown at left, "Development of the Management Job." Center is list of objectives set up by mid-management, approved by top management and turned over to teams from line management to work out methods. What line management comes up with on two repreesntative objectives is outlined at the right

. . . produces self-starting supervisors

. . . stimulates enthusiasm

. . . builds a working management team

THE DEVELOPMENT OF THE MANAGEMENT JOB

1. Top-management separates managerial personnel into three levels.
2. "A" mid-management committee defines line-management job objectives.
3. Mid-management approves job objectives.
4. Top-management approves job objectives
5. "B" mid-management committee assigns resource men to job objectives.
6. "C" mid-management committee assigns individual line-management teams to job objectives.
7. "D" mid-management committee informs line-management on job objectives, resource men, and team assignments.
8. Teams present to line-management the "what to do" to attain each job objective.
9. Representative teams present to mid-management selected "what to do" for review.
10. Teams present to top-management reviewed "what to do" for approval.
11. Teams present to line-management approved "what to do".
12. Top-management committee establishes results as organizational information.

MANAGEMENT JOB OBJECTIVES

1. BUDGETING
   The control of expenses.
2. DISCIPLINE
   The maintenance of productive relationships between people
3. EQUIPMENT
   The proper use of available facilities.
4. HOUSEKEEPING
   The administration of orderliness and cleanliness.
5. INDUCTION
   The timely establishment of employment requirements.
6. ORGANIZATION
   The achievement of a management team.
7. PLACEMENT
   The assignment of the right person to the right job.
8. PRODUCTIVITY
   The efficient attainment of plans and schedules.
9. PROGRESS
   The self-development of the individual.
10. QUALITY
    The realization of acceptable employee and product performance.
11. SAFETY
    The promotion of hazard-free work conditions.
12. TRAINING
    The instruction and education of man-power.

THE MANAGEMENT JOB

DISCIPLINE
The Maintenance of Productive Relationship between People

1. Think, act, and look like a member of management.
2. Administer training, personal progression, and individual responsibility.
3. Foresee and adjust the potential causes of employee friction.
4. Effect placement in accord with physical and mental capacities.
5. Contact everyone in area of responsibility every day.
6. Individualize proper corrective action.
7. Keep work force constructively busy.
8. Observe the limitations of existing work agreements.
9. Follow line organization control principles in personnel status decisions.
10. Recognize and maintain what belongs to management.

THE MANAGEMENT JOB

EQUIPMENT
The Proper Use of Available Facilities

1. Define departmental requirements to the employees.
2. Use forms and records for the planning of efficiency.
3. Employ related staff services to help solve subject problems.
4. Maintain necessary practices to avoid abuse of facilities.
5. Use machinery for its specified purpose.
6. Instruct people every day about the proper use of equipment
7. Establish and follow regular inspection and maintenance procedures.
8. Contribute to the most efficient handling methods of materials and of products.

New management development program . . . continued

members of the presidents' staff. Each level has its own area of authority, its own duties to perform —yet all three are interdependent, and the effectiveness of one level is closely allied with the performance of the others. Visually presented, this structure takes the form of a pyramid with the broad base of line-management leading up to the policy-making group of top management (see page 119).

MANAGEMENT OBJECTIVES ESTABLISHED

The program's first assignment went to the mid-management group who were asked to define line-management objectives. In regular weekly meetings, this group worked out a tentative list of job objectives which, in their opinion, described supervisory duties. The selection of objectives was difficult and was further complicated by the need to define each function. If the budget is an objective, how is it described? How is productivity defined? Or quality put into one short, concise sentence? The mid-management group debated, considered and argued until a list of supervisions' objectives were developed. This was forwarded to top management for approval.

After a thorough review, top management revised several objectives, added a few more ideas and returned the list to mid-level for further work. The process was repeated and, after several more sessions, an acceptable presentation was made. Twelve main objectives to be achieved by management were established as a complete statement of the management job at Jack & Heintz:

1. **Budgeting:** the control of expenses
2. **Discipline:** the maintenance of production relationships between people
3. **Equipment:** the proper use of available facilities
4. **Housekeeping:** the administration of orderliness and cleanliness
5. **Induction:** the timely establishment of employment requirements
6. **Organization:** the achievement of a J&H team
7. **Replacement:** assignment of the right person to the right job
8. **Productivity:** the efficient attainment of plans and schedules
9. **Progress:** the self-development of the individual
10. **Quality:** the realization of acceptable employee and product performance
11. **Safety:** The promotion of hazard-free work conditions
12. **Training:** the instruction and education of manpower.

With the guideposts thus set up, work in the Program began in earnest. Members of line management were divided into four groups of about 20, each group being given the objectives of management and assigned the task of determining what must be done to achieve them. Each group was then organized into three- or four-man teams, with each team assigned one or two of the objectives. The teams were made up of men from unrelated departments, different plants, and with varied experience to get the widest possible representation of supervisory skills and backgrounds. Their job was to find practical ways and means by which line management could effectively satisfy the purpose and intent of each objective.

TYPICAL LINE MANAGEMENT TEAM gets together after working hours to discuss a management objective assigned them. Means of achieving the objective is determined on their own initiative, requires hours of preparation before presentation. Sources of information include personal experience and observation, literature, and any other means their ingenuity can devise

DISCUSSION TEAMS FIND ANSWERS

The program required members of each team to talk about their assignments before their own groups and, to help them in their preparation, resource men from mid-management, (who had helped develop and define the objectives) were assigned to each team. Work started immediately, with the individual team members using their own initiative to develop such sources of information as literature on the subject, personal experiences and observations, talking with their own associates, and any other means possible that

POINTERS AND SUGGESTIONS ARE OFFERED a line-management team by resource men assigned from mid-management group who review material and provide help before a presentation is made. Active interest is natural because they share responsibility for quality of the team's presentation

would provide the data needed. Many discussions were held in the preparation of worksheets that outline the fundamentals of meeting management objectives, and these worksheets form the framework upon which all presentations are based.

Men in the sessions listen carefully and critically to the presentation each team gives, and presentations must be broad enough to have application in any and all departments. It is essential that the methods presented be uniform and standard for all supervision. If the group feels the presentation does not adequately cover the subject or is too limited in scope, the teams are sent back for further preparation until the talk is finally acceptable.

After discussions on one objective have been completed in all four line-management sessions, one composite team is selected to represent line management on the subject in a presentation before the mid-management group. The presentation is again given constructive criticism and, as on the line-level, the team may give several presentations before mid-management is completely satisfied. Each objective is handled in the same way until all 12 have been presented. After approval of the presentation of an objective by mid-management, the next step is an appearance before top-management, where authority for ultimate approval rests. The team then returns from top-management to speak before the four line-management groups to present the finalized method of achieving line-management's objectives to all line supervision.

PRESENTATION OF METHODS devised by a team to achieve management objectives is made to mid-management. Prior to this presentation, they appeared before line management groups where constructive suggestions and comments were made. Discussions improve as a result of repeated performances until the methods finally presented are the best possible

NOTES ARE COMPARED by team members after a presentation. Here plans are made to make next talk better, more effective, and ways are discussed by which suggestions can be incorporated into another presentation. When a team is finally ready to present methods to top management all members are confident that the ideas worked out are right. As a result of this program, close cooperation exists on all levels—as well as complete understanding of management problems and how to handle them

WHAT IS ACCOMPLISHED?

With this technique, the Management Job Program provides an organizational approach to the question of managements' job, all supervisory personnel participate, and all three management levels are pulled together for related contributions to the problem. The program gets all levels of management men thinking seriously and objectively about their share of supervisory responsibilities. Line management writes its own job ticket because these supervisors take the objective established by mid-management and decide among themselves what should be done to accomplish them. The talks and presentations before all levels of supervision are the means by which these decisions are put in shape for final approval but behind these talks lies the basic core of the program—the hard, serious, down-to-earth thinking and preparation for the job responsibility.

The program establishes a uniform guide for management. All levels work together to set up the objectives and methods, and the objectives and methods used to develop them serve as a standard by means of which all supervision can function as a team. Line-management has the opportunity to discuss the objectives and policy of supervision with mid and top-management, thereby establishing close cooperation which will continue long after the program is completed. Management men know each other better, know how to work together as a team, develop respect for the ability of others and confidence in their own ability. They have a clear understanding of the over-all functioning of supervision, and after listening to and participating in discussions on the 12 objectives, they re-evaluate the extent of their own duties and carry them out more effectively. A broad perception of the meaning of management exists, and they know how their individual duties tie in with the complete management objective.

Cope Talks on Draw Dies ... XXVII

Stainless and nickel alloys

These materials have greater strength than drawing-quality steel; they tend to gall and pick up. To figure reductions you will need to use different constants than given in Installment V

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND 1, IND

Stainless steels and nickel alloys are widely used for stampings, because of the corrosion resistance and strength of these metals. The die designer must, however, give special consideration to the properties of these materials and their behavior in drawing. Otherwise, he may expect poor work, extremely short tool life, possibly even a broken die or press.

Most stainless-steel stampings are made from three analyses of stock: 13% chromium steel, 17-20% chromium steel and 18% chromium-8% nickel steel. The first kind is used for the general run of stampings where corrosion resistance is the principal requirement. The latter two materials are specified when the blank must undergo severe forming or deep drawing.

Nickel alloys like pure nickel, Monel and Inconel are extensively specified for stampings that must have special properties.

Dies Not Radically Different

Deep-drawing-quality sheet and strip in stainless steel, nickel, Monel and Inconel may be drawn into any shape that is feasible with deep-drawing steels. Physical characteristics of these materials differ from those of deep-drawing steel, but not to the extent that radically different dies are needed for average pressing jobs. Properties of the materials are:

1. Stainless steel, nickel and high-nickel alloys are 50% stronger and harder than ordinary steel.
2. Chrome-nickel stainless is tough and gummy. In blanking and piercing there is little or no breakout. The material must be cut clear through. Straight-chromium steel, nickel and high-nickel alloys have normal breakout qualities.
3. All of these materials have a tendency to "pick-up" and gall against the dies.
4. Chrome-nickel stainless steel, nickel, and high-nickel alloys are hardened by cold working more rapidly than ordinary steel. Straight chromium steels work-harden the same as ordinary steel.

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Because of the greater strength and hardness of these materials, larger presses, with twice the power used in working ordinary steel, are required. The dies must ordinarily withstand about double the pressures used for ordinary steels. Correspondingly heavier pressure pads and greater air pressures are required to prevent wrinkling. Dies also wear more rapidly. Cutting edges should be made from the best grades of wear-resisting tool steel.

Punches and dies for cutting stainless steel, nickel and high-nickel alloys should be made of alloy steel heat treated to a tough temper—Rockwell C 58 to 61. The two types of steel most generally recommended are: (1) oil-hardening manganese die steel having an approximate composition of 0.90% carbon, 0.50% chromium, 0.50% tungsten, and 1.25% manganese; or (2) 18-4-1 high speed steel containing 0.71% to 0.76% carbon.

The shear load to cut these materials is 15 to 20% greater than for soft, mild steel of equal thickness. Therefore, if possible, punches and dies should be designed stronger than for ordinary practice in cutting steel. This precaution is particularly desirable for small punches.

Punches and dies should be kept sharp at all times to avoid microscopic tears around the edges of the holes. If the blank is subject to repeated flexure in service, defective hole edges are likely to cause fatigue failure.

Punching of stainless steel, nickel, high-nickel alloys or any metal results in appreciable hardening along the edge where cutting takes place. If the blank is to be severely cold worked in a subsequent operation, annealing is recommended.

Blanking

Straight-chromium stainless, nickel and high-nickel alloys "break out" normally. They require the same clearance between punches and dies as soft and medium steels. Divide metal thickness by

require stronger draw dies

16 to find the total clearance, or difference between the diameters of the punch and die for round work. For ¼ in. and heavier plate, it is often desirable to use slightly less clearance than for steel, to produce a clean blank or a hole free of burrs.

In blanking and other cutting operations on chrome-nickel stainless steel, the clearance must be held closer than for soft and medium steels, regardless of metal thickness. If clearance is too great, the metal will be drawn in between the punch and die, and will work-harden to such an extent that excessive strains are put on the tools and press. An unsatisfactory cut is the result. For light gages, clearance between punch and die (on one side) should be 0.001 to 0.0015 in. maximum. For heavier gages it should be 0.0015 to 0.002 in. maximum. Because chromium-nickel stainless steels do not break out, it is necessary that the punch cut all the way through the metal.

Forming and Drawing

Special precautions must be taken to prevent picking up, galling, or loading a drawing die employed on stainless steel, etc. Carbon steels have a thin oxide coating. Galling takes place only when this coating is broken, as when wrinkling has occurred, and pressure required to iron out these wrinkles causes a break-through in the coating. Resulting rubbing together of two similar metals causes "pick up" and galling. The particles that flake off and cling to the die are very hard. They can be removed only by laborious grinding and stoning. Once these particles form around the die mouth, they scratch the stampings. Finally, after a few hundred stampings have been made, the condition becomes so bad that the sides of the stampings are often torn out.

Stainless steel, nickel and high-nickel alloys have no oxide coating. Their surfaces are "bare" metal. These metals therefore have a strong tendency to gall against carbon steel, the bare metal being drawn immediately attempts to freeze to the die. The first shell is often deeply scored and badly torn; the die is loaded heavily with metal particles in an attempt to draw a single shell.

Various means are used to overcome the trouble caused by bare metal. Among these are: (1) the use of die materials different from those ordinarily used for drawing steel, (2) greater clearances (3) slower press speeds, and (4) special lubricants.

Galling or pick-up can occur through no fault of the die. Because stainless steel, nickel and high-nickel alloys show a predisposition for this trouble in the first place, the cause may be in material that is over gage, non uniform, or off temper. Pickup can be started by die scratches caused by work-hardened burrs left from blanking or piercing.

Burrs may also cause uneven flow of metal between pressure pads and die rings, resulting in wrinkles. Burrs can, of course, be removed from blanks, but this is expensive and time consuming. The operation may further work harden the area immediately adjacent to the blanked or punched edge. The best remedy for burrs is to prevent them. This is accomplished by using high-quality material and carefully designed blanking and punching tools, and by good tool maintenance.

Straight-chromium stainless steel work hardens at a rate only slightly faster than ordinary steel. When making shallow draws, this material can be drawn with about the same press speeds and clearances as for ordinary steel. Greater die clearances and slightly slower press speeds should be used for deep draws. Stainless steel, nickel and high-nickel alloys will draw and form about the same as ordinary steel, but stretching of the metal must be avoided.

Nickel, Monel and Inconel work harden considerably faster than ordinary steel, and chrome-nickel stainless steel work hardens nearly twice as fast as ordinary steel. These materials should be drawn at about one-half the press speeds used for deep drawing of ordinary steel. The reason for this is that slower press speeds work harden the metal more gradually and allow it to be pulled into the die without fracture.

More frequent annealing may also be necessary between draws. The different grades and brands of these materials have widely different metallurgical characteristics. Therefore, the annealing operation will be performed differently for each type. Specific instructions for annealing should be obtained from the company from which the material was purchased.

Diameter Reductions

Diameter reductions for drawing stainless steel must be carefully planned. There is a wide difference in behavior between the different types of stainless steels during drawing. For example, with 18-8 chrome-nickel steel, a large reduction in diameter from the blank in one operation is possible;

Cope Talks on Draw Dies ... XXVII ... continued

but succeeding reductions must be very conservative. On the other hand, 17-20 straight-chromium steel cannot be drawn to as small a diameter from a blank in one operation, but greater reductions can be obtained in redrawing. Consequently, a set of dies designed to draw a shell from 17-20 straight chromium steel cannot ordinarily be used to draw a shell of the same proportions, out of the same stock thickness, from 18-8 chrome-nickel steel.

To find the maximum reductions for drawing either type of stainless steel, use the accompanying formulas and table of constants in the same manner as described for drawing ordinary steel in Installment *V* (AM—Sept 28 '53, p126). Values of constant *K* are given for metal up to ⅛ in. thick. For drawing shells of greater metal thicknesses the percentage method of computing diameter reductions should be used, Installment V. The size and the shape of first-operation shells for drawing square and rectangular and other non-round work from both types of stainless steel should be found by using the same methods described for ordinary steel in Installment *VII* (AM—Dec 7 '53, p156).

Formulas for Drawing Stainless Steel:

First operation dies:

$$d = \frac{K\,D}{100 - 0.625\,D}$$

For all redrawing dies:

$$d_1 = \frac{K_1\,d}{100 - 0.625\,d}$$

$$d_2 = \frac{K_1\,d_1}{100 - 0.625\,d_1}$$

$$d_3 = \frac{K_1\,d_2}{100 - 0.625\,d_2}$$

Where:

D = blank diameter
d = mean diameter of first shell
d_1 = mean diameter of second shell
d_2 = mean diameter of third shell
d_3 = mean diameter of fourth shell

K and K_1 are constants that depend upon the thickness of the metal to be drawn

Values of *K* for First-Operation Die

METAL THICKNESS IN.	18-8 STAINLESS	17-20 STAINLESS
0.016 to 0.018	61	68
0.020	58	65
0.022 to 0.024	56	63
0.028	54	60
0.030	50	56
0.060	47	53
0.125	51	51

Values of K_1 for All Redrawing Dies

METAL THICKNESS IN.	18-8 STAINLESS	17-20 STAINLESS
0.016 to 0.018	81	77.5
0.020	80	76.5
0.022 to 0.024	80	75.5
0.028	79	74.
0.030	77	74.025
0.060	75	73.5
0.125	65	65

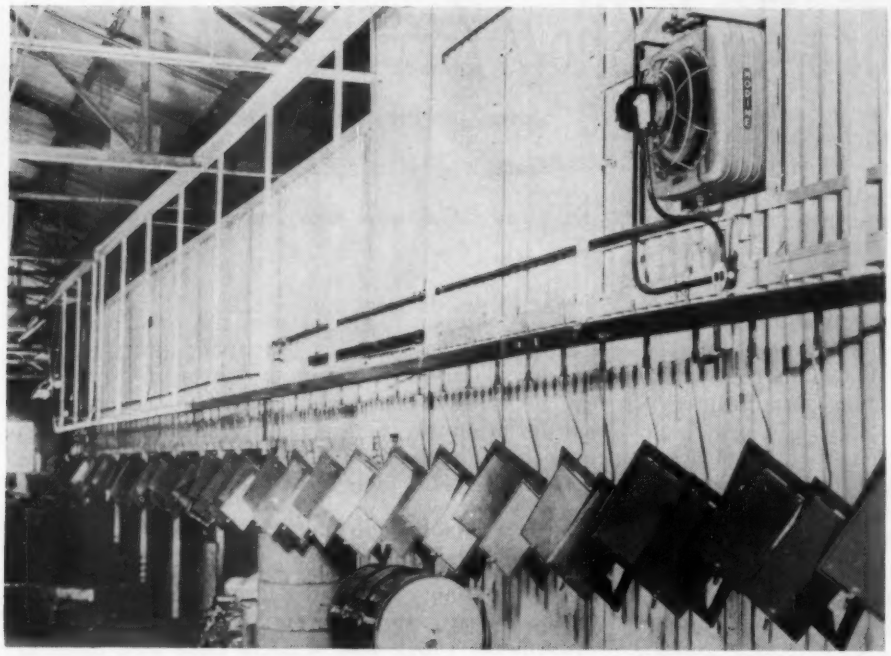
Diameter reductions for drawing nickel and high-nickel alloys should be computed by the percentage method. A well-balanced series of reductions for light-gage cylindrical shells would be 35 to 40% for the first, or cupping operation, and 15 to 25% for redraws. The amount of reduction should be decreased slightly on each successive redraw.

Avoid Excessive Reductions

Although reductions up to 50% have been made in high-nickel alloys in one operation from a flat blank on a production run, it is necessary, in order to keep shell breakage low, to employ all known factors that contribute to the best possible setup. Large reductions always introduce the probability of excessive breakage. Excessive reductions are likely to open the surface of the metal and increase finishing costs. Under normal conditions it is not advisable to exceed the percentage reduction in diameter given in Installment *V* (*AM*—Sept 28 '53, p 128) for drawing plain steel and tin plate.

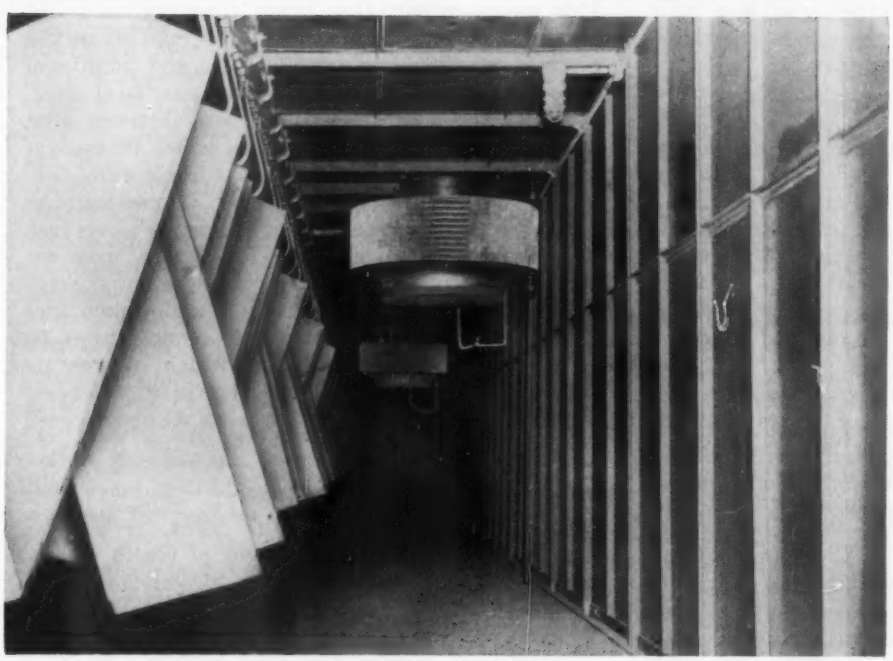
Part XXVIII of Mr. Cope's series will appear in an early issue.

"Just finished a course on being a better foreman, so they gave me this department . . ."



Incinerator panels are dried . . .

. . . in a third the former space by Moline unit heaters installed in tunnel walls (exterior view) at Majestic Co. Units circulate air and maintain 145F



Farm machinery is dried . . .

. . . at rate of 53,000 lb per hr by Young Radiator vertical-discharge heaters at J I Case Co. Both drying time and power requirements were reduced; oven can be heated to 180F in 5 min

Simple formula for paint drying: UNIT HEATERS

One plant doubled production; another saved on construction costs, when paint-drying tunnels were fitted with unit heaters. J I Case, Racine, Wis, uses vertical-discharge heaters that eliminate all ductwork. Five are installed to produce 2,750,000 Btu per hr and keep air in turbulence. Majestic Co, Huntington, Ind, uses one wall-mounted heater to condition a 50-ft tunnel. In both cases, initial costs and maintenance expenses were low

Why a Machine Tool Show?

M A HOLLENGREEN,
president and general manager, LANDIS TOOL COMPANY, WAYNESBORO, PA;
president, NATIONAL MACHINE TOOL BUILDERS' ASSN

In September, in Chicago, will be held the greatest display of new machine-tool models ever to be assembled under a single roof: the Machine Tool Show, sponsored by the National Machine Tool Builders' Association.

This will be the fifth Machine Tool Show held under the auspices of the Association (previous shows were in 1927, 1929, 1935, and 1947). While in area not as large as the 1947 Show, held in the Dodge Chicago plant (no longer available), this Show will far surpass '47 in demonstrated rate of technological advancement. It will be supplemented by a Production Engineering Show on the Navy Pier, which will demonstrate technological developments in metal-cutting accessories and other devices conducive to increased productivity.

Why a show?

The principle of the market-place is as old as history. Produce *could* be peddled from house to house, and is to some extent; but it is impractical, and the main point is that customers prefer the central market. They like to be able to go from stall to stall, seeing what all vendors have for sale, making comparisons, and gaining a sense of satisfaction over selecting from a wide range of offerings the particular items they prefer.

The Chicago Show is literally a machine-tool market-house. The U S Government lists 441 distinct types of machine tools — not to mention various sizes and combinations. Machine-tool salesmen do the best they can, backed up by advertising and sales-promotion literature — but they can hardly acquaint every manufacturer in the country with every possible new model that might be of use to him. And you can't carry a machine tool in a brief case and take it out and demonstrate it on a customer's desk.

The answer is a Machine Tool Show where *all* of the latest types of machine tools will be on exhibit at the same time. There the customer can literally "go to market," visit one display after another, note the machines suitable to his operations, and compare their desirability for his particular purposes. Furthermore, the machines will be in operation, demonstrators will be on hand, and the customer will be able to get specific answers to questions regarding the use of a machine on his particular type of work.

In short, the Show is held primarily for the benefit and convenience of the customer. By visiting the Show he can learn far more, in much less time, of possible equipment for his own use than he could sitting at his desk writing letters of inquiry, studying circulars, and talking to salesmen. Not only can he cover much more ground, but he can also see the machines themselves performing work, instead of simply reading about them or listening to someone describe their operations.

Spur to technological advance

Another sound reason for a Machine Tool Show is that it inevitably spurs all the manufacturers within the industry to accelerate the technological improvements which will obsolete their own models. This means simply that every company naturally wants to be able to have ready for exhibit at the Show a product with new features and additional improvements, that will obviously be a "good buy."

But to the user of machine tools, it means that **the Show advances the date upon which he can get better ways of removing metal at lower cost.**

The moment a Show date is set, wheels begin to move faster in a machine tool company's research and design department. Projects which may for some time have been under consideration are accelerated. Ideas experimentally undertaken are crystallized by show tests. New models must be ready for the Show — models which incorporate substantial advantages. Setting of the date insures that research and development work will be speeded up to meet the deadline.

Why pick 1955 as a show year?

A brief historical resumé is called for by way of background. With the outbreak of World War II, when the need for immediate production overshadowed all other considerations, machine-tool designs were frozen.

During the war years, a great many excellent production ideas were developed by contractors and machine-tool engineers. Many were of equal value in the production of civilian goods. Immediately after the war, the machine-tool industry tackled the job of incorporating the best of these in its machines, and brought out the models at the 1947 Show.

But the time between the end of the war and that Show was very short. The industry, still suffering from the post-war competition of government-owned machines dumped on the market in enormous quantities, was depressed. Potentialities indicated by research and experiment had not yet been properly realized.

The president of the NMTBA here answers your questions about the forthcoming Chicago Show—exhibits, transportation, hotels —as well as such basic ones as why a Show at all, why this year, and why in Chicago

After the 1947 Show, the level of the industry sank lower; then the industry was plunged once more, overnight, into feverish production activity because of the Korean crisis.

It was only after the Korean episode that there was evident the full flowering of research, invention, and development programs which had long been in the making.

The outcome was—and I don't think I am exaggerating it in the least—that **far more technological advances have been incorporated in machine-tool models designed in the few years since Korea, than in any 15 or even 20 years of the industry's previous history.**

I shall make no attempt here to go into details. But I might mention briefly advances in automation, the development of transfer machines, applications of electronics, the perfection of control devices, the advent of new tracing and contouring mechanisms, etc. This will be the first Machine Tool Show to include a comprehensive display of hydraulic and mechanical presses. Makers of these products are now members of the National Machine Tool Builders' Association, and recent advances in this field are remarkable indeed.

Why Chicago?

We are sometimes asked why Chicago was chosen as the city in which to hold the Machine Tool Show. The answers are very simple.

First: It is the only city which has a large-enough Show space with a floor capable of carrying the loads required by machine tools. To accommodate the Show, the management of the Stockyards, which owns the International Amphitheatre, agreed to build an additional Exposition Hall adjoining and opening into the Amphitheatre. This gives the Machine Tool Show a total floor area of 428,000 sq ft. No other exhibit facilities capable of carrying heavy floor loads provide comparable space. For instance, the Cleveland Public Auditorium offers only 240,000 sq ft, and the Atlantic City Public Hall only 230,000 sq ft.

Second: Chicago is the only city which possesses enough hotel rooms to accommodate visitors to the Show. Over 10,000 hotel rooms have already been reserved for this purpose. Such facilities are obtainable only in Chicago.

Third: Chicago has a central location, which, by and large, is most convenient to machine-tool users throughout the United States.

The staging of the Show involved many problems: First was the matter of available display space. The total, though large, is smaller than at the 1947 Show, and the number of companies wishing to display is larger. Original requests for exhibit space far exceeded the area in hand. A solution was arrived at by the following measures: (1) Show exhibits will be confined to machine tools only; (2) the size of the exhibit space each machine-tool builder requested was substantially reduced; (3) no foreign-built machine tools will be exhibited at the Machine Tool Show.

This still left no room for instruments, accessories, etc. The result was a decision to hold on the Navy Pier, in conjunction with the Machine Tool Show, a Production Engineering Show devoted to the exhibit of mechanisms and equipment that contribute to greater production, and thus provide an opportunity for the display of items for which there will not be room in the Amphitheatre and Exposition Hall. Both Shows will be under the management of Clapp & Poliak, who managed the 1947 Show.

Another problem was transportation. This was solved by developing a continuous shuttle-bus service over three round-trip routes:

1. Between Loop hotels and the Machine Tool Show
2. Between Loop hotels and the Production Engineering Show on the Navy Pier
3. Between the Machine Tool Show and the Production Engineering Show.

Another question was power. This will be provided by a new high-tension line from the Central Manufacturing District power plant. **Total connected load will be about 60,000 KVA, largest of any building in the world, and special transformers and lines will be installed to carry it.**

Another question was that of internal communications. This will be handled by a system of overhead wires which transmit messages from the Show office to tiny pocket receiving sets carried by floor managers, who can then go to a telephone and call back.

Rules for exhibitors have been carefully worked out in order to insure uniformity, and — above all else — maximum visibility. **Nothing is permitted which will interfere with the easy viewing of the machines themselves.** The arena in the center of the Amphitheatre, with a ceiling clearance of 73 ft, provides space for the showing of taller machines. Clearances in other portions of the exhibit floors range from 15 to 26 ft. The entire Show will have the appearance of a giant machine shop in operation.

Demonstration of economies

What machine-tool builders will have on view at the Show will be the latest models of new machines — but what will be demonstrated at the Show will be the latest methods of cutting manufacturing costs. We call it a "Machine Tool Show" plus a "Production Engineering Show" — **but its title properly should be "A Thousand-and-One Ways of Reducing Cost per Piece Produced."**

Salesmen can help you ...if you'll let 'em

Spellbinders don't last long selling to today's shop men; successful salesmen know they must come back to sell again, and that confidence and trust must be built. Here are five things the good salesman can do for you

H M KINNE, supervisor,
Advertising & Sales Promotion Section
ALLIS-CHALMERS EXPORT DEPT,
GENERAL MACHINERY DIVISION

1. He informs himself thoroughly before attempting to see you. He studies his company bulletins with you in mind . . . searches for the facts that will be of value to you to demonstrate how this equipment can fit in your plant or operations and save you time or money. You welcome the good salesman because he is well prepared and gets right to the point.

2. When he calls he brings his literature with him and uses it to support his claims . . . to tie his facts to the pictures and diagrams and thus enable you to follow his story with understanding. He doesn't make vague statements . . . or wander far from the subject. His presentation is well organized.

3. He follows up his interview with literature that you can study at your convenience. Sometimes it is the bulletin you looked at together . . . . sometimes it is a different one that tells a supplementary story. But he helps you by seeing to it that you get all the facts on which you can base your decisions.

4. Sometimes, care and operation manuals convey facts that are not found in sales literature. The helpful salesman realizes that these booklets are not solely useful as instruction books. Rather, he brings them to you and shows you from them points that help you evaluate the equipment in respect to your needs.

5. When a process or line is in the planning stages, often an informed salesman can be of immeasurable benefit to you in bringing application data, facts on materials, or construction features to your attention . . . or to the attention of your engineers when you put him in touch with them.

Work Simplification...

program for profit

WILLIAM M STOCKER, JR, associate editor

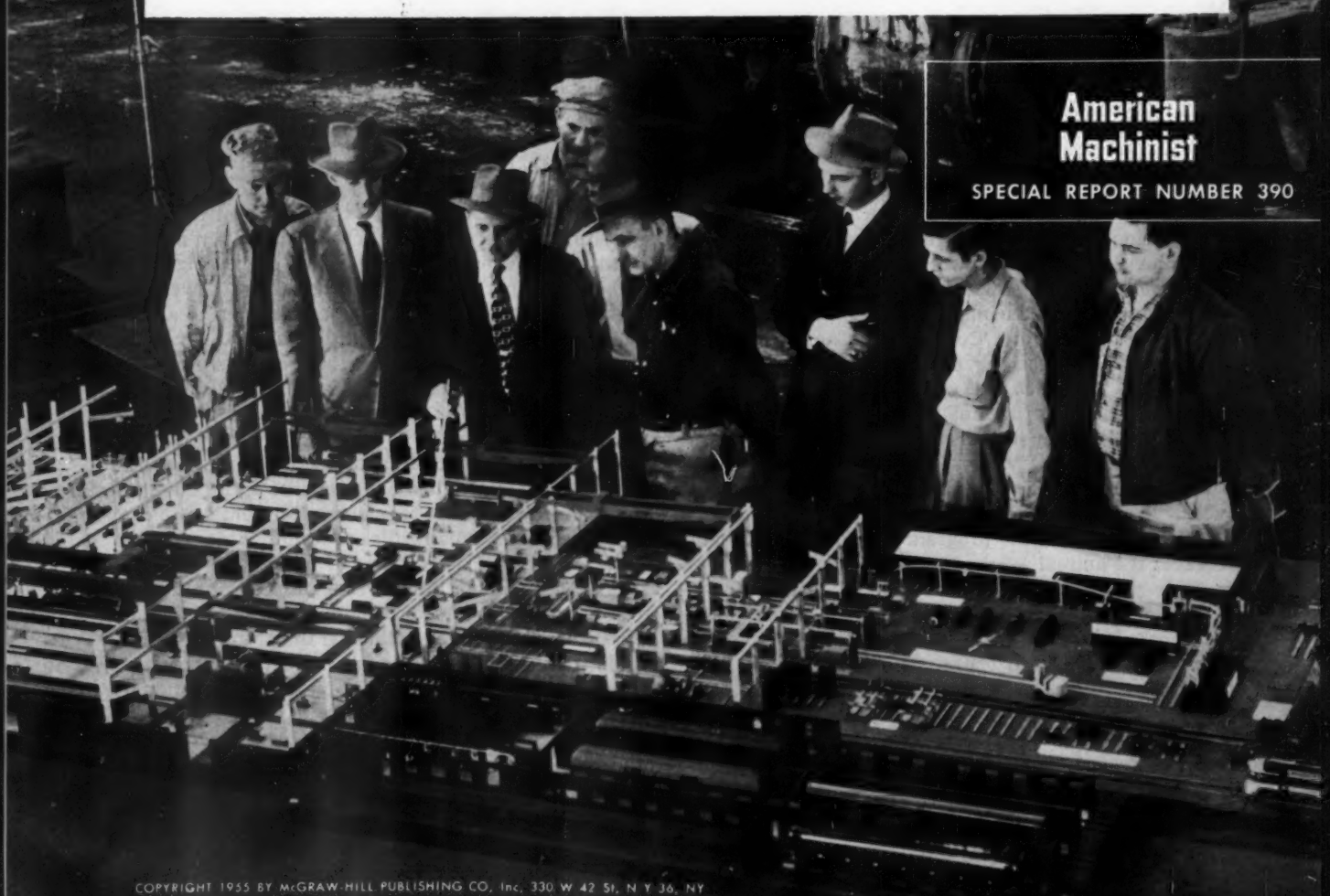
According to the parable, a man spent his lifetime searching the World around for a diamond; then returned home, old and tired, to find the finest jewel in his own front yard.

Are you seeking an *expert*, a super-intellect, to solve the problems in your plant? Perhaps the best solutions are right at hand—in the know-how of your own people. These jewels are free for the asking. All you need to do is organize the expedition, provide the tools for prospecting, and help sort the stones. You will be amazed at the profit that lies buried in *your* garden.

Management at The Chesapeake & Ohio Railway Co faced a serious problem common to many railway operators in recent years. Diesels were rapidly replacing steam locomotives. How could maintenance and overhaul facilities be organized and integrated to efficiently handle both types of equipment, as well as passenger coaches and special problems? Tentative estimates called for three years of study and planning, a long-range conversion program, and a $3-million investment in plant and equipment.

Meanwhile, 60 people in the company's in-plant work-simplification program at the Huntington, W Va, shop had gone to work on the same problem as a training project. None of these trainees had had any previous experience at plant layout or planning. In six weeks they completed the basic plan and asked local Management for an appraisal. Their ideas showed so many advantages that a detailed plan was presented at the next meeting of the Board of Directors and $1¼-million was appropriated to carry out the conversion. Results are far ahead of expectations, with savings more than $2-million.

Here is the story: how the training program was organized, how the study was carried out, the principles of production improvement, and a variety of money-saving ideas. Emphasis is on attacking the problem, while specific railway equipments serve only as examples.



American Machinist

SPECIAL REPORT NUMBER 390

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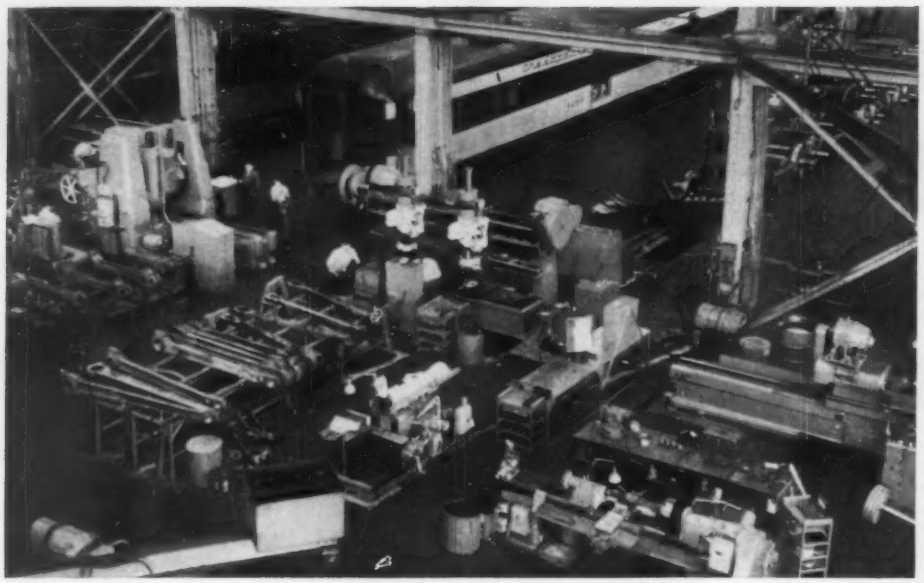

MACHINE-TOOL BAY for passenger-car shop is planned on "product" basis; provides only tools necessary to complete operations on passenger-car components. Reduction in mechanic's walking time, measured in man-feet, saved more than $10,000 per yr in this shop alone

WHAT WORK

Work simplification is just common sense with direction. However, the *direction* is a very important part. It is the difference between a carefully thought-out program for profitably attacking the problem of unnecessary and excessive expenditure of time, effort, and materials and a haphazard hit-or-miss approach. Essentially, work simplification, as a program, is a system for getting everyone concerned into the habit of looking for better ways of doing things, weighing apparent improvements, and implementing the use of worthwhile ideas.

Formal work-simplification programs have produced, and are producing, major savings for many companies. Ford Motor Company of Canada has an estimated annual saving of more than 163,000 hr plus more than $55,000 worth of materials. The Cleveland Electric Illuminating Co has saved thousands of dollars on simplified paperwork alone. The Maytag Company saved $31,000 in man-hours in the first year of the program and $54,000 the second year. The Bell and Howell Company saved $61,000 in the first year of the program and has greatly increased the annual average in the years since.

Thus you can see that work-simplification programs are not a new idea and that the techniques have been proved practical. The Chesapeake & Ohio Railway Co had been operating a program according to the recommended plan, and with sizable savings, for more than a year when a really big and unexpected saving took place. *The surprising value resulted from a work-simplification training group.* A total of 60 people from the shop, people untrained in industrial engineering, was brought together for training in the concept and procedure of work simplification. These people ranged from apprentices to a general foreman, at the top, and with all of the various labor grades in between. However, in the training group every member is given equal voice and every opinion equal weight.

The C&O, like many other railroads, was faced with two problems. One was to revamp facilities to permit maintenance and overhaul of an ever increasing number of diesels, meanwhile retaining the ability to efficiently maintain the decreasing, but still very important, steam locomotives as well as provide a similar service for passenger cars, all at the Huntington, W Va Shop. The second problem was to cut costs; to modernize the archaic, sprawled-out operation that had resulted from rapid growth and years of war and post-war rush when all available time was devoted to "getting out the job." In the terms of a product manufacturer, this would mean tooling up to turn out ever increasing quantities of a new product requiring many entirely new operations, but meanwhile continuing to produce decreasing quantities of the old product, as well as revamping the plant for lower manufacturing cost.

Essentially as a training project, the 60-man work-simplification class tackled the problem. While actual classwork was only two hr per man per wk, enthusiasm ran high and trainees worked lunch periods, evenings, weekends, (and perhaps a little of their working time) to solve the problems that confronted them. This was the first time in the history of the railroad that this level of employee was actually encouraged to participate in a major

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GIANT PLATE ROLL was to be moved to new location and plans included building a concrete-pit foundation. Instead, roll was mounted directly on a smaller concrete slab with the platform built around it. Saving was $12,000 and roll is easier to operate

DISASSEMBLY OF PISTON and connecting rod required two men until the operation was studied and simplified with this roller-top "bench." Now one man does the job easier and faster than previous two men

SIMPLIFICATION CAN DO

planning job. From habit, it had been customary for every employee up through General Foreman to look to the Superintendent for every major decision. Now ideas were welcomed and they came forth in abundance.

In six weeks, the group had completed the basic plan, including 3-dimensional model layout and detailed instructions for each shop. Local management was asked to appraise the job and make further recommendations, as well as to point out any impractical ideas. Of course, because planning had followed a logical and systematic procedure, there was a specific reason for every step. Management liked the proposed improvement so well that, much to the trainees surprise, it was suggested that the entire plan be shown to the C&O Board of Directors. After carefully reviewing each major phase of the plan, the Board voted $1¼-million, the amount needed to actually put these ideas to work.

Initially, $1-million was saved on construction alone because the plan was based on more efficient use of existing buildings. Then, at least $1-million more was saved by more efficient utilization of tools and equipment on hand. This is not a saving in production time, but, rather, in capital investment. The program will pay for itself in less than three years.

Production savings have been building up ever since the program got underway. For example, wheel shop operations formerly required 16 hr per day. Now, the same amount of work is done in less than 8 hr and additional work is sought to keep the shop fully loaded. By replacing old wheel lathes with contour-follower lathes, 20 pairs of wheels are machined in 8 hr where only 8 pr were previously possible. Installation of a deVilbiss traveling paint-spray booth to replace the old hand-spray paint shop saved $165,000. Simplified mounting of a large boiler-plate roll saved $12,000. An improved concept of machine-tool layout, using the "product approach" rather than the "process approach" that is typical of many job shops, has saved considerable time and handling. Also, all light machine tools are mounted on heavy-gage boiler plate instead of on permanent foundations. Thus, mounting is cheaper and the machine can be moved into various product groups as work loads change. One other big saving is in the use of auxiliary service shops adjacent to the main dissassembly, overhaul, and assembly areas.

Work simplification creates still another improvement. One of the most difficult jobs in revamping a shop is to get the people who must use the equipment to accept the improved ideas. When these people have provided the ideas, when they have gone through the labor pains step by step and know why each change is made, acceptance is not a serious problem. They want the program to be successful. And every person concerned with the program finds himself with a deeper appreciation of his company, his fellow workmen, and his place in the modern industrial world. Furthermore, the trainee is better equipped to understand and appreciate the reasons behind company policy and management decisions; attitudes that previously seemed illogical or unsound. Work simplification training supplies a foundation for idea building.

HOW WORK SIMPLIFICATION IS TAUGHT

WORK SIMPLIFICATION TRAINING sessions combine lectures and discussions; rely heavily on visual aids. Ball in center is reminder to "stay on it." Traffic light is used to direct discussion. Red means "you've got the red light on—open up" or someone wants to add something or ask a question. Green means "Go ahead—you have an open mind." Regardless of employee position, every trainee has equal voice

While cynics have said that the chances of a committee arriving at an accomplished result are inversely proportional to the number of members, it is far more believable that an organized group following systematic procedure will achieve more reliable results than an individual.

The work-simplification program at C&O is based upon the techniques taught at the Work Simplification Conferences, under the direction of Allan H Mogensen, at Lake Placid, NY and Sea Island, Ga. These Conferences, held annually since 1937, are laboratories of practical working operations, rather than merely discussions of theory. Companies, such as C&O, that are interested in installing a work simplification program send one or more delegates to one of these six-week conferences. The delegate returns to the company fully equipped to set up and handle in-plant training sessions for department heads, supervisors, foremen, and workers.

Each delegate takes with him some problem from his own company. From these are selected the problems that seem to offer the greatest value to the conferees as well as to their companies. Then an improved method for doing each job is developed and the development techniques are studied. Each delegate learns how to set up a program, how to use motion pictures to teach supervisors, how to analyze work methods and train operators, how to sell ideas to foremen and executives, and what tools are available to improve methods and increase productivity. Upon returning to his company, the delegate teaches the principles of work simplification to other members of the company for application to their particular problems. Particular attention is paid to the problem of increasing production without adding to existing equipment.

According to Allan Mogensen, there are three ways to get results from people: We can *tell* them; we can *sell* them; we can *consult* them. There has been far too much of the telling approach. Almost everyone resents being ordered to do something. Whether we like it or not, we must deal with people through the selling and consultative approaches if we are to achieve cooperation and success. For best results, work simplification programs require the consultative approach. Many companies have tried it and found that it works. But this approach requires two things: First, belief that your people have worthwhile ideas and, second, the humility to consult them about their ideas.

How many times have you heard stories like the one about the lathe operator who invented a new tool holder and offered it freely to the large automotive company that employed him? When they turned it down flatly as unsound, he sold the idea to a local tool company and it sold thousands of the toolholders to the inventor's employer as well as to the company's competitors. It offered exceptionally good tool life. Had his company really given him a fair analysis of the idea?

First of all you have to be convinced that this consultative approach has merit. Then you must believe that you can get better results through consulting than you can by the selling approach —or that you can get better results from combining these two methods than by the original approach of telling people what they are going to do. Unless you have confidence in this basic approach, it is better not to initiate the program.

At C&O, one of the delegates to the Work Simplification Conference was E E Slack, supervisor, Work Simplification. Mr Slack has been with the C&O for many years in a variety of operating responsibilities, hence he has wide familiarity with the problems and conditions of railroad shop operation. He was given supervision of the work-simplification training program that included the 60-man group responsible for this outstanding planning job on the Huntington shops.

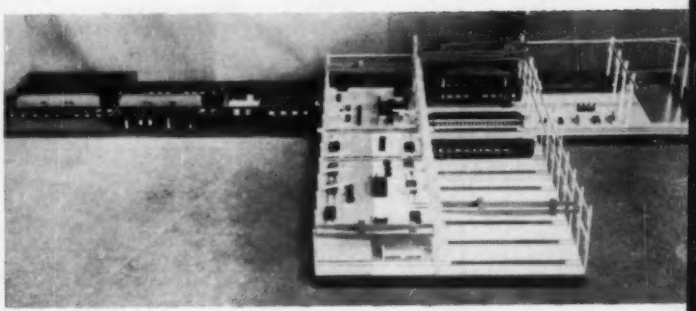
Trainees for the program are selected on the basis

ENTHUSIASM for conversion program caused many trainees to work at home, as well as lunch periods and weekends. This man is building accurate-scale model crane under the watchful eye of his daughter. For many trainees, the program became a hobby. Additional training is now given in cost appreciation and conference leadership

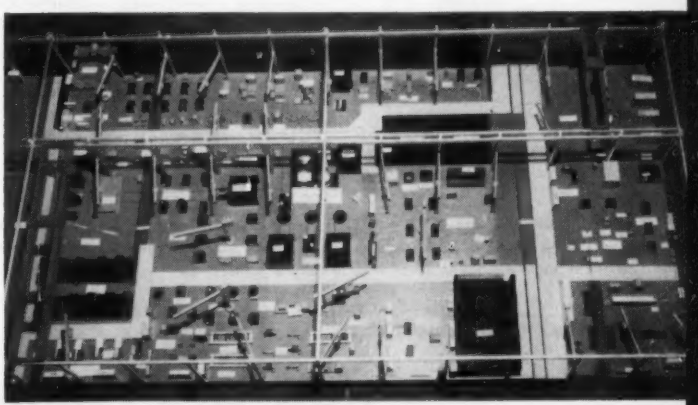
of their interest in shop activities, their attitude toward their work, and their department, the latter to provide distribution of training throughout the shop. The primary program consists of one two-hr session per week for 9 weeks. Now an additional 20 hr of advanced training in cost appreciation plus 18 hr of conference leadership is given, or 56 hr total. Employee rank is not a factor in selection. The training program starts with an introduction to the principles of work simplification. This phase includes topics such as the importance of asking "Why?" about every operation and method, the methods for analyzing a problem, information and cost sources, techniques in describing and "selling" an idea, methods for making inexpensive three-dimensional models and layouts, and elementary human relations, which are so important.

Then the trainees are taught to use the simple tools of industrial and cost engineers, tools such as the flow process charts; the multiple activity chart (which leads to the most economical use of men and equipment); principles of motion economy; the operator chart; basic elements of motion; plant layout techniques; relationship of work simplification to safety; and inventory control methods. Emphasis is on learning to *think* and the tools that give direction to thinking.

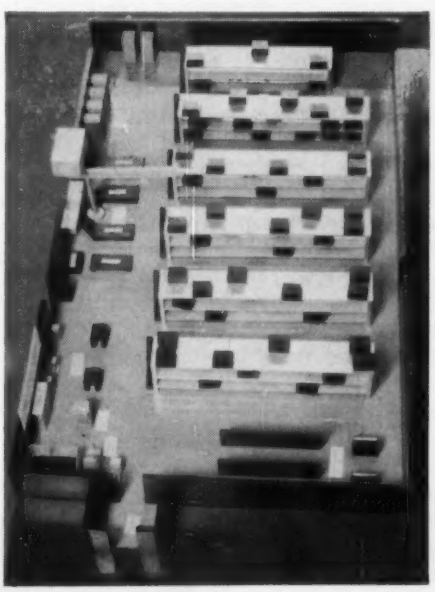
Finally, a number of problems are selected and groups of five or six people are assigned to each problem, with one person in each group as the supervisor. Each problem is reduced to its elements and members of the group analyze the elements, suggest new methods, and study each method. The consultative approach is used and each member must *sell* his ideas to the others in the group. Then, when all of the problems are worked out, they are presented to the entire class, discussed and evaluated. Also, if a conflict appears in the solution of two or more problems as solved by individual groups, steps are taken to adjust and integrate the methods.



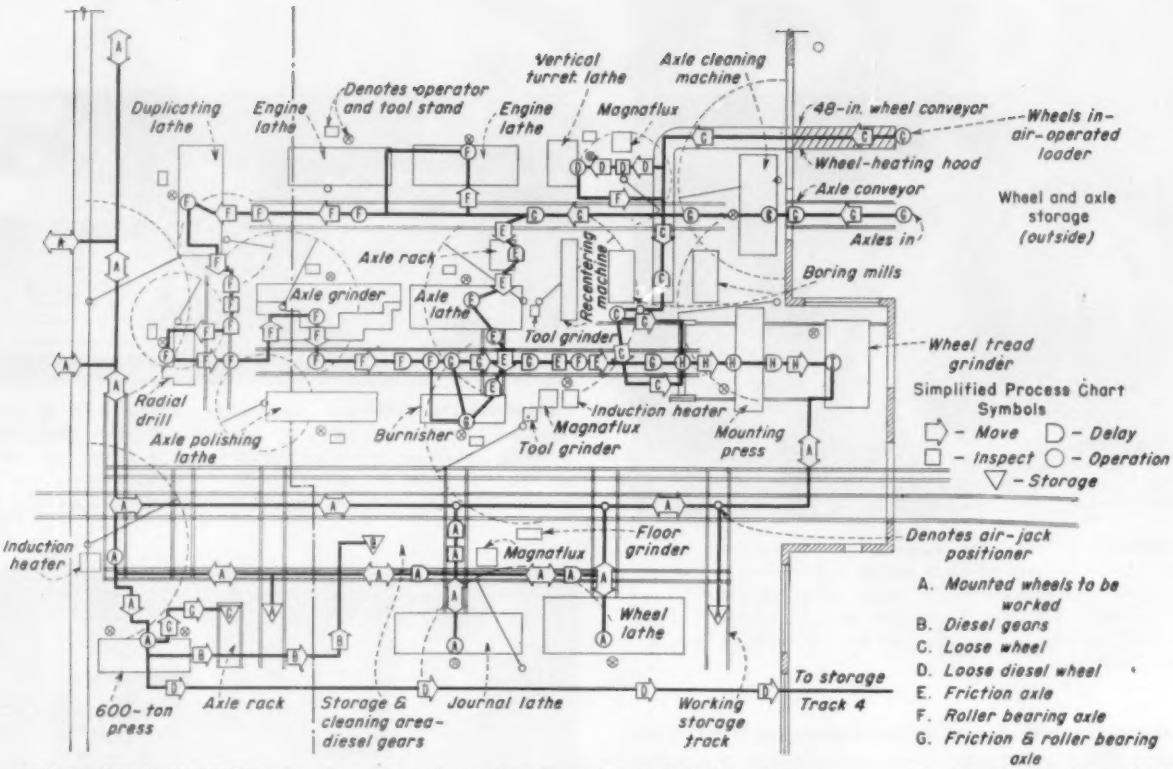
PASSENGER-CAR SHOP was designed to overhaul 7 to 10 cars per month; is turning out even more. Use of scale models in planning conversion minimizes conflicts and problems, as well as improves ease of "selling" idea to management—especially people unfamiliar with mechanical drawings



ELECTRICAL SHOP concentrates all electrical overhaul, maintenance, and repair in one area; with a special shop included to handle passenger car electrical equipment. Work flow was planned to minimize handling. New electrical shop replaces old boiler shop



BATTERY SHOP provides all of the equipment necessary to repair, service, and charge storage batteries, plus a motor-generator set to supply the charging racks. Batteries are steam cleaned as they come in, then are given whatever service Inspection indicates is necessary. Batteries always are ready when needed



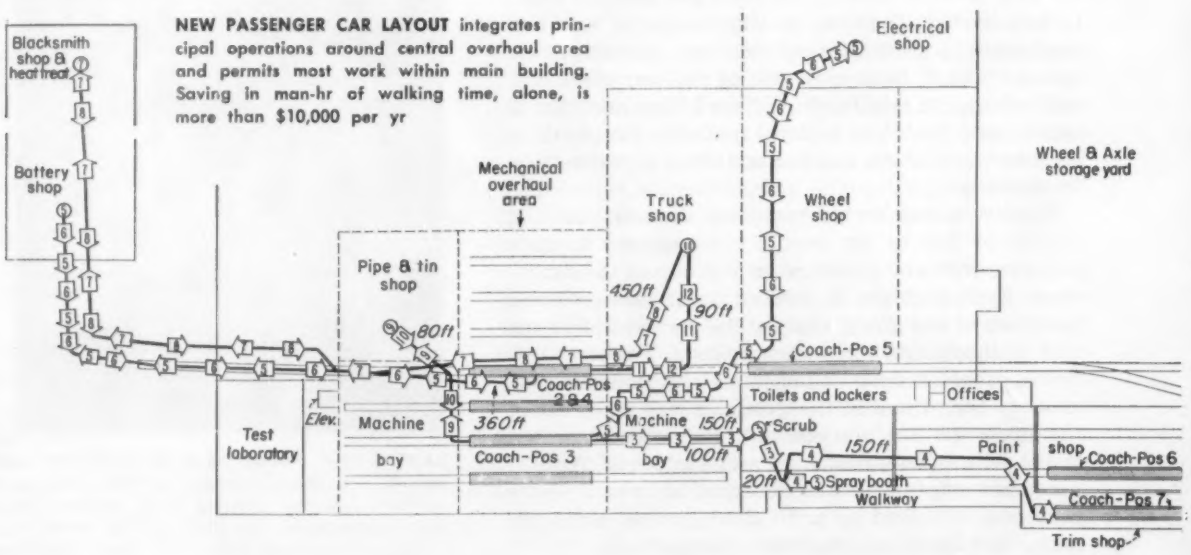
NEW WHEEL SHOP LAYOUT is based on principal operations for major products; is central to diesel and passenger car overhaul areas as well as wheel storage. Improved flow plus new machines more than doubled production

Work simplification . . . A SPECIAL REPORT

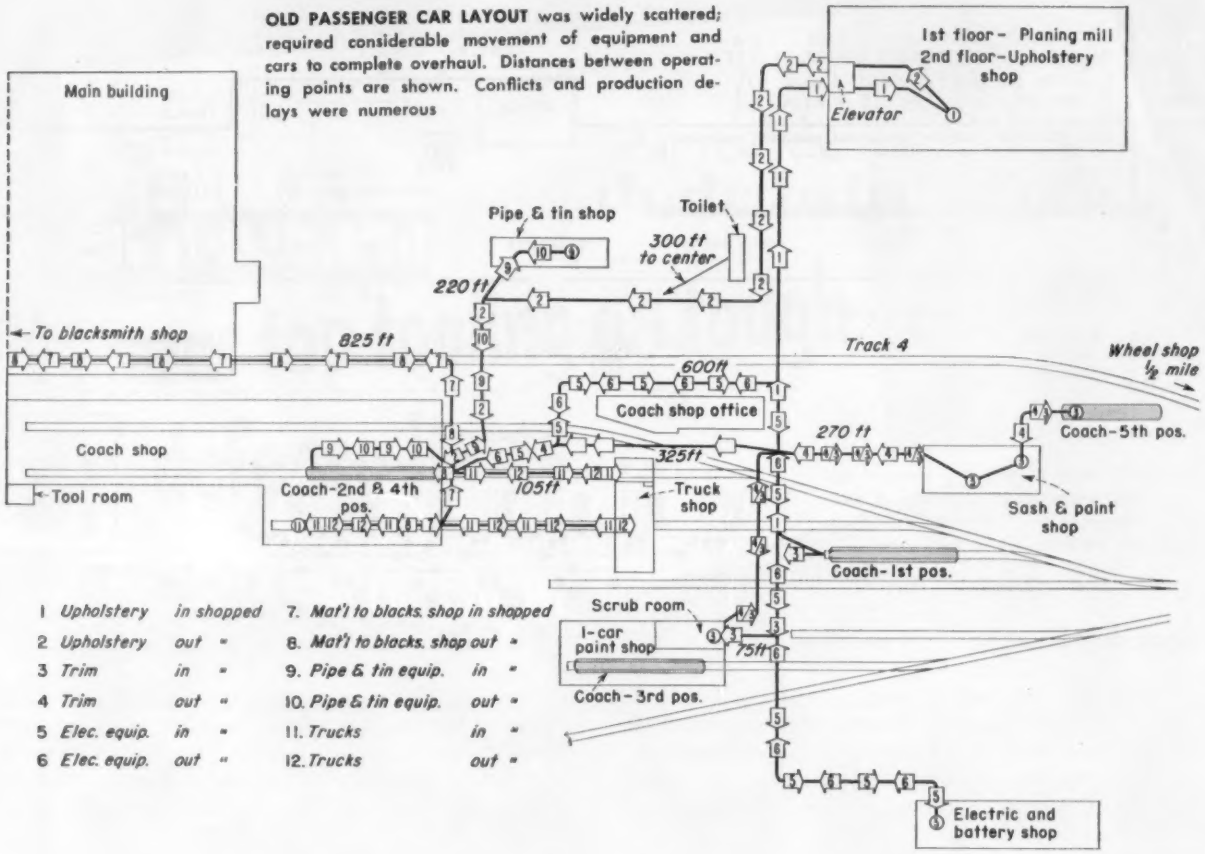
HOW C&O PLANNED IMPROVEMENT

Regardless of the size of a complex task, a seemingly difficult problem can be simplified by breaking it down into key phases. When, after the initial definition, these phases still appear complicated, they can be further sub-divided into elementary components. Then, like building blocks, each of these components can be studied and improved or eliminated; can be balanced against each other for integration with the assembled program. When each component is clearly defined and unencumbered by the involved pattern of the whole program, solutions are reached with a minimum of trouble. Finally, all of the components are assembled, last minute conflicts are adjusted, and the new program is ready to roll.

By using this system, it is possible to have many people solve a number of problems simultaneously or a few people solve one problem at a time. The choice depends upon the size of the task, the time



NEW PASSENGER CAR LAYOUT integrates principal operations around central overhaul area and permits most work within main building. Saving in man-hr of walking time, alone, is more than $10,000 per yr



limit, the number of people involved, and the budget.

Two other steps are important. Some of the people in the program may be verbal minded but it is likely that most will learn by visual means, hence a detailed schematic chart of the problem breakdown, as well as a detailed written description, should be prepared before analysis is started. (*AM*—Dec 6, '54, p129). Secondly, definite completion dates should be set for each phase of planning. Unless the "building blocks" are delivered on time, completion of the total program is difficult.

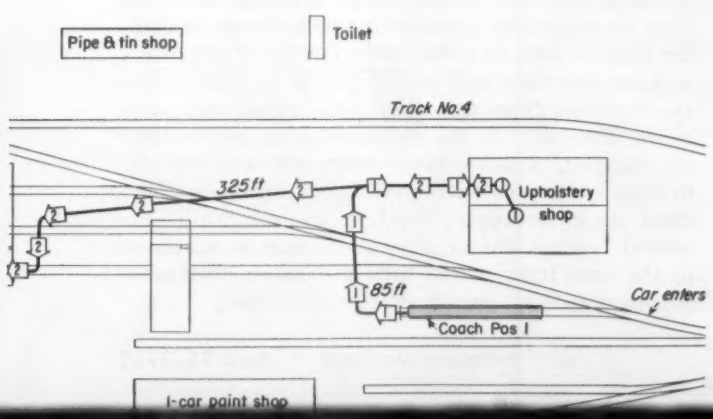
At the C&O Shops in Huntington, W Va, reconversion was a major project involving a number of buildings, acres of floor space, and thousands of tool and equipment items. Breakdown was essential, but the work simplification training group had to choose one of many possible systems. The task could have been divided into unit areas, or on a space basis; it could have been divided by operational elements, such as electrical equipment, assembly, machine shop, and painting; and a "product" breakdown also was possible to mention a few.

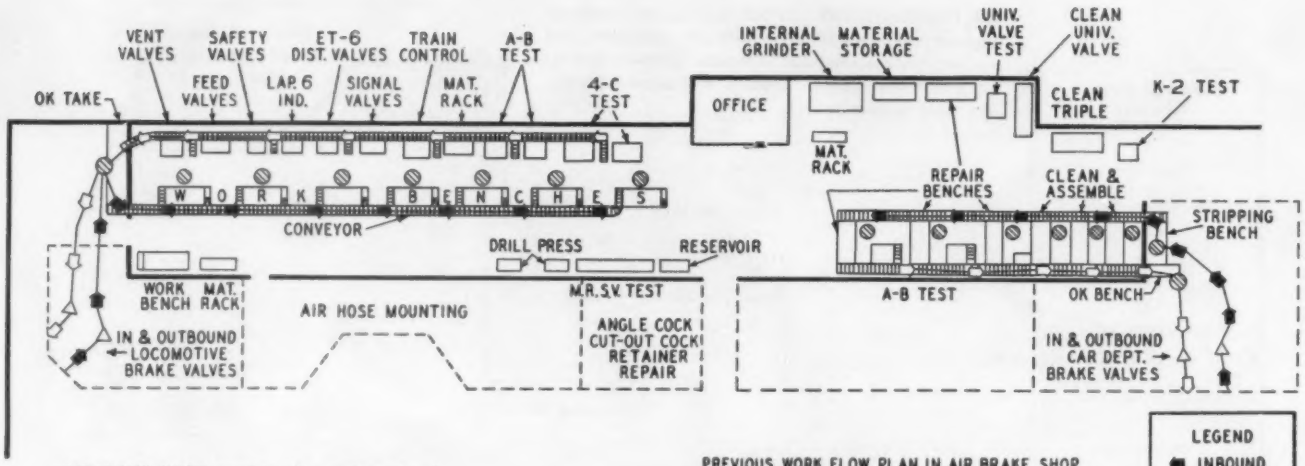
Because the conversion program was intended to provide an integrated facility for servicing and overhauling a variety of "products"—railway equipment —and because some of the components in this equipment required similar operations, the product breakdown was selected for determining key phases.

Thus the total problem was divided into five phases: *Wheel, Passenger Car, Steam, Diesel* and *Stores*. Then, each of these phases was further subdivided into *physical requirements* such as floor space, tools, equipment, and utilities; *manpower; work flow* and *personal facilities.*

Each task was assigned to a specific committee of from 3 to 10 people, depending upon its complexity, and one member of each committee was elected supervisor. A joint committee of supervisors integrated the units, for working out conflicts of floor space requirements, facilities, etc.

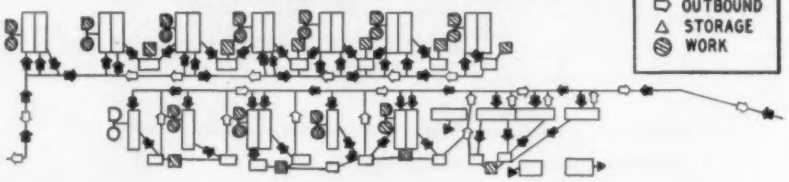
Diesels were relatively new to the Huntington Shops when the program started. In anticipation of the formal conversion plan, the company sent a five-man team of specialists to survey other railroad facilities and techniques for maintaining these new giants. This team prepared an extensive and very helpful report on their findings which they presented to the training group. The team also worked directly with the trainees in planning the





AIR-BRAKE SHOP consists of a series of multiple units, each doing a variety of tasks. New plan saves time and handling by conveyorizing work and using line operation

PREVIOUS WORK FLOW PLAN IN AIR BRAKE SHOP



Work simplification . . . A SPECIAL REPORT

facilities for the repair and overhaul of diesels.

Prior to conversion, the Huntington Shops turned out one completely overhauled heavy steam locomotive per day plus a variety of special maintenance jobs. Passenger cars were maintained at Huntington as well as at Richmond, Va, and at Grand Rapids, Mich. Now, the Huntington Shops turn out 26 diesels per month, handling straight annual overhaul, power assembly, some heavy engine work including crankshaft changes, plus accident repairs. They also overhaul a number of steam locomotives per month and most of the passenger cars. And they still do special construction and maintenance jobs.

As one of the first steps in the program, the training group got a large layout drawing of the Huntington Shops. Then this was used in the detailed layout of each shop. From the drawings, scale models of the shops were prepared and color coded for the old arrangement. As each committee submitted ideas to the program the color code was changed to indicate the new arrangement.

This scale model was extremely valuable for planning and *integrating* all of the elements of conversion. From this layout, two outstanding problems of excessive cost were immediately apparent: The wheel shop was located one-half mile from the main shop where wheels are removed from equipment and replaced. Thus every wheel and axle had to be transported one mile and wheels are a major item in the shops. The second apparent source of waste was the improper utilization of space. Many shops still had space assignments based on requirements of years earlier.

For instance, steam locomotives used to require considerable blacksmith work and the blacksmith shop at Huntington was extensive. However, diesels and more modern equipment have greatly reduced the workload. Now, after conversion, this shop has been divided to provide a very efficient heat-treat department, with adequate blacksmith facilities, plus one of the most modern and complete battery shops in the country. Both of these shops are adjacent to the equipment areas that they will serve and space utilization is far more practical.

Materials handling was another source of general expense. Aside from the wheel problem, the auxiliary shops and repair areas were not efficiently located in relation to the main assembly and disassembly areas. In other words, layout was more on the job-shop "process" basis than on a "product" basis, yet this kind of facility has more of the characteristics of a repetitive production shop than it has of a short-run job shop. This is an important point. Many service facilities in Industry are operated on a job-shop basis either because they started that way or because the apparent nature of the work suggests it. Actually, the majority of these shops could operate more efficiently on a "product" basis—especially where a narrow range of similar equipment is regularly serviced.

Different crafts are involved, for example, in overhauling diesel trucks (wheel units) than are used on locomotive-tender and passenger-car trucks. Hence in the new arrangement these shops are separate and each shop has facilities to fulfill the operations required for its specific "product."

Analysis of maintenance procedures showed that electrical work on passenger cars could be consolidated into one special shop. The new electrical shop for passenger cars is adjacent to the passenger-car shop as well as to the main electrical shop, thus does not interfere with heavier work. As components are removed from cars they are tagged and numbered, then sent to the electrical shop, where they are cleaned, disassembled, inspected, and rebuilt. In some cases previously overhauled units are taken from stock for replacement in the car while, for special reasons, the original units may be returned to the cars from which they are taken. This procedure speeds up passenger-car production.

American Machinist

SPECIAL REPORT NUMBER 391

"Here's our top tooling on tough defense items..."

Forty-one Acme Gridley, three Conomatic and one New Britain Gridley automatic multi-spindle lathes, plus six multi-spindle Acme Gridley hydraulic chuckers along with eight Brown & Sharpe automatic single-spindle lathes are making fuze and rocket components at Easy Washer. Here are 17 Acme Gridley Automatics; seven are 8-spindle, 2⅝-in., RB'S. Three each are 6-spindle 1⅝-in., RB's, 9/16-in. RA'S and 5¼-in. RAC hydraulic chuckers, and one is a 1¼-in. RA. Typical of the many jobs held to close tolerances for size and finish are the two jobs (three setups) described here. These bar machines are presently running 80% of gross. Rejections at machine are 2%, setup rejections 2½%, for a total of 4½% on the steel component. Aluminum component is running 70% of gross with rejections at machine 2.2% and setup rejections 2.8%, for a total of 5%. Both components running with one operator per machine.

Five machining and two gaging operations of the hundreds on fuze and rocket components have been solved particularly well at Easy Washing Machine Corporation, Syracuse, NY. Details of setups and methods, one on a new production pantographic engraver, two on boring machines, and two on bar automatics are described, plus two optical gaging setups. As told to E J Tangerman, executive editor, by ...

FRANK UNGLEICH, tool engineer, automatics

EASY WASHING MACHINE CORPORATION, SYRACUSE, NY

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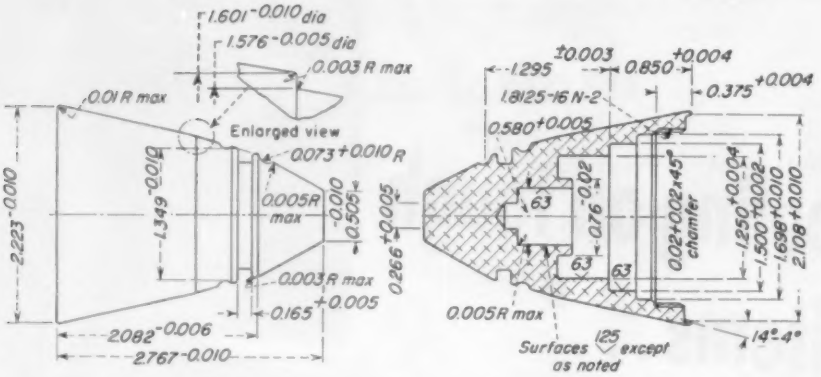
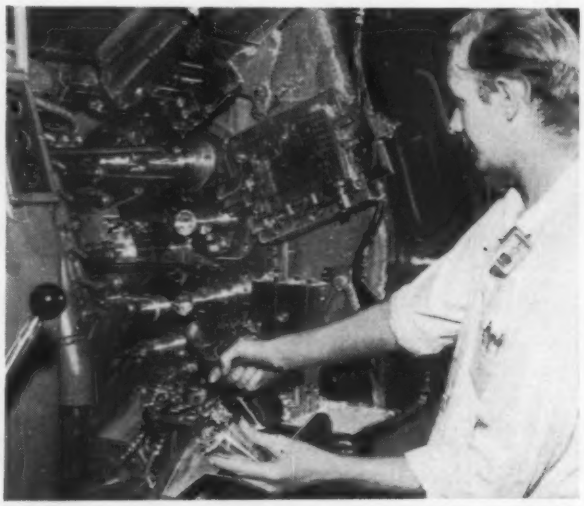
ALUMINUM FUZE PART FINISHED ALL OVER IN ONE CHUCKING



ONE FUZE COMPONENT is produced from 2¼-in., 75-S aluminum alloy rod in 16 sec (gross production 224/hr) on a 2⅝-in., 8-spindle, Acme-Gridley RB-8 automatic. With a spindle speed of 674 rpm, revolutions per piece total 143. Even though the piece is machined all over to finished dimensions and high surface finish, no secondary contour-boring, threading or turning operations are required. Complexity is evident from the drawing and photograph

SKETCH		CAMS SIZE	CAMS TL NO	EQUIPMENT TYPE	TL NO
POS 8	ROUGH ALL OVER DRILL 1.25 AND TAP DIA ROUGH TURN	9/32" 0.002/REV	40	CIRC FORM TOOL CIRC FORM-TOOL HLDR CIRC FORM-TOOL BOLT CIRC FORM-TOOL SUPPORT SUBLAND DRILL DRILL BUSHING KNEE TURNER TURNING TOOL	50 51 52 53 54 67 119 120
POS 1	SEMI-FINISH REAR C'BORE ALL DIAS EXCEPT 2.108	1/4" 0.0018/REV	41	DT FORM TOOL DT FORM-TOOL HOLDER C'BORE BUSHING	56 57 66 67
POS 2	FINISH-FORM FRONT TO 1.60 DIA TREPAN (RGH) CHAMFER TAP DIA	0.0018/REV		DT FORM TOOL DT FORM-TOOL HOLDER TREPAN HOLDER TREPAN TOOL BUSHING ANGULAR KNEE TURNER CHAMFER TOOL	64 65 96 97 71 62 63
FACES SHOULDER 0.850 DIM POS 3 FACES SHOULDER 1.380 DIM	FACE END C'BORE 2.108 DIA REAM 1.25 AND 1.500 DIA	1/4" 0.0018/REV	42	FACING TOOL SPEC TOOL HOLDER ADJ TOOL HOLDER C'BORE TOOL MADISON BOTTOMING BAR MADISON BORING CUTTER BUSHING	68 69 72 73 86 87 88
POS 4 USE TOP HOLE LEVER RATIO 1.20675 TO 1	TAP 1.812-16 THREAD FINISH-FORM REAR REMAINDER	1/4 0.0018/REV	43	DT FORM TOOL DT FORM-TOOL HOLDER FOLLOW-UP CAM TAP TAP BUSHING RELEASING TAP HOLDER UNIV THREAD ATTACHMENT	74 75 76 77 78 79 ST'D
POS 5	FINISH-FORM REAR	1/4 0.0018/REV	44	DT FORM TOOL DT FORM-TOOL HOLDER SPRING SUPPORT ADJ BLOCK	80 81 82 83
POS 6	FORM GROOVE DRILL 1/4 AND 9/16 DIAS	3/16 0.0018/REV	45	GROOVING-TOOL HOLDER GROOVING TOOL STEP DRILL ERICKSON CHUCK (181) ERICKSON COLLET (9/16) BUSHING 2"	84 85 58 59 60 61
POS 7 USE CENTER HOLE LEVER RATIO 1 TO 1	ACCEL REAM CUTOFF	0.002/REV		GLENCO HOLDER ACCEL REAMING ATTACH REAMING-ATTACH CAMS STEP REAMER CUTOFF TOOL HOLDER CUTOFF TOOL	89 STD 90 91 92 93

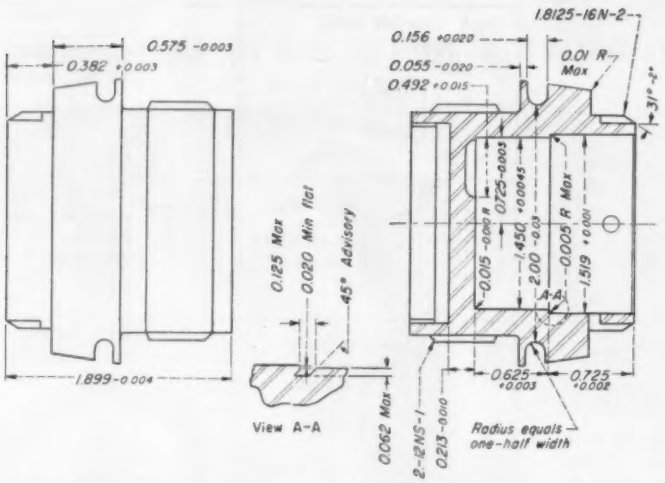


SHAPING BEGINS AT POSITION 8 with form-tool roughing outside and step drilling inside with a subland drill. At Position 1, the far end is semi-finished and all inside diameters but the largest are counterbored with a spiral form-ground, radial-relieved tool. Position 2 includes a trepanning operation to rough-shape an inner step. At Position 3, the largest ID is counterbored, while a special Madison trepan cutter faces the shoulders and reams the 1.250 ID, the 1.500 ID, and the 0.760 diameter. This cutter is adjustable for size to allow for the expansion of aluminum on the 1.500 + .002 dimension. At Position 4, the 1.812-in.–16 thread is tapped while the nose is finish-formed. A solid, 8-flute tap is used with concentricity to 1.500 ID held to .002 TIR. At Position 5, a rotating support steadies the part for finish-forming of the nose. Positions 6 & 7 handle drilling and accelerated reaming of a 2-diameter center hole, during grooving of the nose at 6 and cutoff at 7. The tool-slide cam is set for 19/32 in. @ 0.0123, followed by 5/32 @ 0.004 ipr (total 17/16 in.) for fine finish. Coolant is 1:10 soluble-oil mixture (Van Stratten Co.—Vantrol #523).

As is the case with many aluminum parts, chips were a major problem. Because it was impossible to break chips because of their ductility, tool angles were altered to coil the chips as tightly as possible to reduce their volume. Conveyors (screw type) were speeded up 100% and chip pans redesigned to funnel chips into the conveyor. Standard 40-hp motors were increased to 50 hp because of increased power consumption caused by high rate of metal removal.

Outside dimensions are checked optically at 10:1 magnification with a Kodak Model 3 contour projector using a four-position staging fixture locating from 1500 – .002 ID

STEEL PART TURNED TO CLOSE TOLERANCES IN TWO OPERATIONS



A SECOND FUZE COMPONENT is turned from cold-finished FS1117 or FS1118 and has several close tolerances, particularly when variations for cadmium-plating, Parkerizing and electrofilming are deducted. This part is made successfully in two operations, one to produce exterior surfaces and the deep bore from bar stock, the other to finish the opposite end on a 6-spindle chucker. (Other makers are finding secondary operations necessary to attain finish or size.) Coolant is cutting oil with 10% sulfur base added. Only finishing operations are to drill three holes (one blind) in a Kingsbury, to cut two outside slots in a Foote-Burt chain broach, and to bore a slot as later described

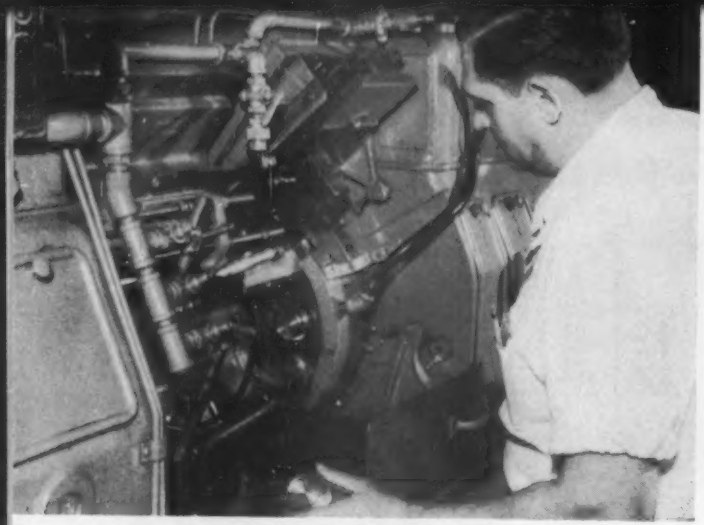
SKETCH	CAMS SIZE	CAMS TL NO	EQUIPMENT TYPE	EQUIPMENT TL NO
POS..8 ROUGH FORM ALL OVER DRILL 1.500 DIA	3/8 @ 0.0028 REV	167	CIRCULAR FORM TOOL	129
			CIRCULAR FORM TOOL BOLT	130
			CIRCULAR FORM TOOL HLDR DD	131
			CIRCULAR FORM TOOL SUPPORT	132
			1 7/16 HSSS DRILL	133
			1 7/16 DRILL BUSHING	134
POS..1 FINISH FORM REAR DRILL 1.43 DIA	3/8 (2 STEP) 5/16 @ 0.0031 + 1/16 @ 0.002	168	DT FORM TOOL HLDR DD	135
			DT FORM TOOL	136
			13/32 HSSS DRILL	137
			13/32 DRILL BUSHING	138
POS..2 CUTOFF PART WAY FINISH FORM FRONT ROUGH CO'BORE 1.451 & 1.521 ROUGH FACE			DT FORM TOOL HLDR	139
			DT FORM TOOL	140
			CO'BORE	143
			1 13/16 DRILL BUSHING	144
			CUTOFF TOOL HLDR	145
			CUTOFF TOOL	146
POS..3 SHAVE & CO' BORE & CHAMFER 1.450 ID NOTE: SHAVE TOOL DOES NOT FACE SIDES OF FLANGE	3/16 @ 0.0014	169	SHAVING FIXTURE	147
			SHAVE TOOL	148
			CO'BORE	149
			1 1/2 BUSHING	150
			SIDE SLIDE	STD
			ANGULAR KNEE TURNER	141
			CHAMFER TOOL	142
POS..4 ROLL FRONT THREAD & RECESS ANG UNDERCUT	SPECIAL	170	THREAD ROLLING ATT	97
			THREAD ROLLS (1.812-16)	98
			UNDERCUTTING ATT	151
			UNDERCUTTING TOOL	152
POS..5 ROLL REAR THREAD REAM & CHAMFER THREAD	SPECIAL	171	THREAD-ROLLING ATT	1
			THREAD ROLLS (2"-12)	2
			CHAMFER TOOL	161
			KNEE TURNER	160
			MADISON BAR	249
			MADISON CUTTER BUSHING	250 114504-(71)
POS..6 CUTOFF PARTWAY, CO'BORE 1.450 DIA & FACE	13/32 @ 0.003/REV	172	CO'BORE	157
			KNEE TURNER	260
			FACING TOOL	261
			CUTOFF TOOL HLDR	162
			CUTOFF BLADE	163
			UNIVERSAL CHUCK	247
			UNIVERSAL COLLET	248
POS..7 REAM 1.450 DIA & CUTOFF			CUTOFF TOOL HLDR	164
			CUTOFF TOOL	174
			REAMER	158
			FLOATING HOLDER	263
			ACCEL REAMING ATTACH	STD
			ACCEL REAMING ATTACH CAMS	279

SEQUENCE OF OPERATIONS on an 8-spindle bar automatic (2⅝-RB) is evident from the layout shown. Time per piece is 39 sec, rev per piece 137, gross production per hr 92 pieces. But that isn't the whole story. Based on 20 years of experience with these machines, there are several "tricks." First, I proposed a special 45° undercut (see detail A) to eliminate a 0.005-in. max radius where the 1.519-in. ID adjoins the shoulder. Accepted by Ordnance, this permits the 1.519-in. ID (0.001-in. tolerance here) to be reamed to size independently of counterbore depths in position 5, so all internal diameters can be completed on this machine.

The 0.625-in. + .003-in. dimension is ground on the step of Position 6 co-bore, and the 0.725 – .002-in. dimension held between co-bore and facing tool. As both of these are held in the same position on the tool slide, machine variations between them are eliminated. The co-bore is ground at 1.510 in. at the large diameter, and as the hole is previously sized by the reamer, it faces the shoulder for the 0.725-in. dimension only @ 0.001 ipr.

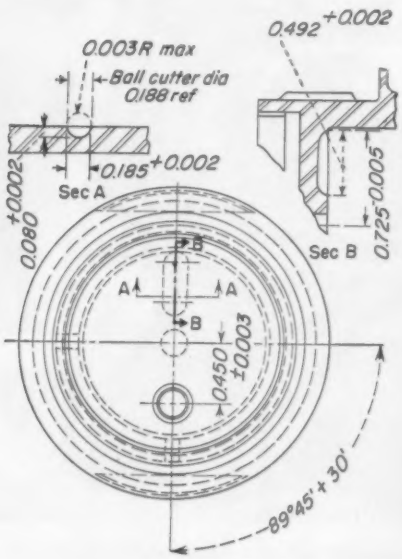
The double-rise tool-slide cam moves ¾ in. at 0.010 ipr, then with 0.001-ipr feed for the last 1/16 in. of travel. This is necessary to finish and size. The 1.450-in. hole is then reamed in an auxiliary reaming attachment prior to cutoff in Position 7.

Two threads are rolled, a 1.812-in.-16, and a 2-in.-12, with "Salvo" thread-rolling attachments, as shown, but 0.382-, 0.575-, and 1.899-in. dimensions are roughed here for finishing on the 5¼-in. RAC chucker

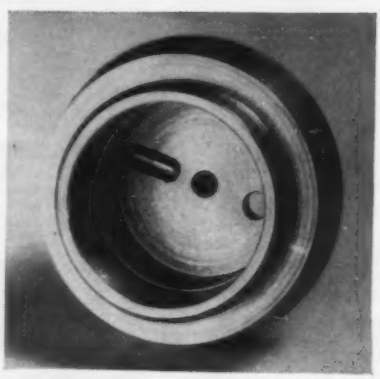


COMPLETION OF THE FUZE COMPONENT is done in 17 sec in a 5¼-RAC 6-spindle chucker at a spindle speed of 283 rpm in 17 sec. Parts are held on segmented, 2-dia Erickson expanding mandrels, with drawbar pressure of 5500 lb. HS facing tools caused excessive variations from loading and wear, so were replaced by carbide. PD tolerance is actually only 0.0036 in. to allow for plate buildup. Taps are 6-flute and held to 0.0005-in. PD tolerance. A flat form tool removes burr on the taper caused by broaching wrench slots

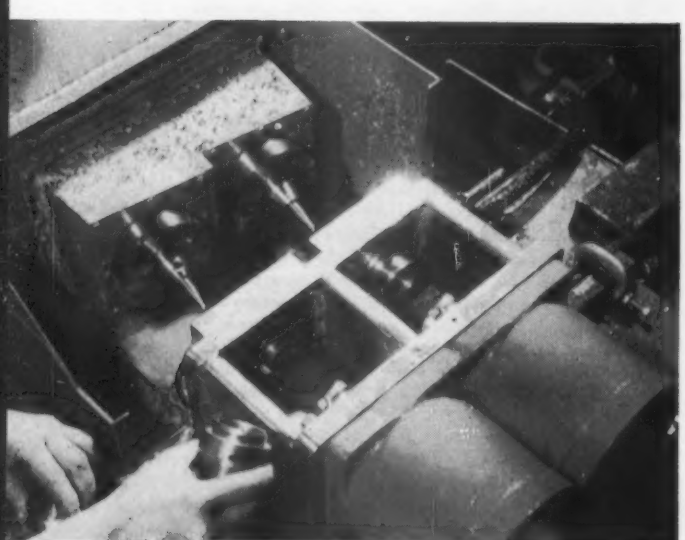
SKETCH	CAMS SIZE	CAMS TL NO	EQUIPMENT TYPE	EQUIPMENT TL NO
POS. 5 LOAD AND UNLOAD			ERICKSON EXPANDING MANDRELS	182
POS 6 — FLAT BOTTOM ROUGH DRILL FOR TAP HOLE			1½" HSSS DRILL 1½" DRILL BUSHING	183 184
POS 1 — ROUGH-DRILL TH'D DIA. SQUARE BOTTOM AND FACE END	3/16 @ 0.0028	179	1 19/32" HSSS DRILL 1 19/32" DRILL BUSHING FLAT-FACING TOOL FLAT-FORM TOOL HOLDER	185 186 187 188
POS 2 — RECESS THREAD RELIEF CHAMFER AND DIA			RECESS FIXTURE RECESS TOOL	189 190
POS 3 — ACCEL. REAM BOTTOM OF TAP HOLE. STRADDLE FACE SHOULDER. USE TOP HOLE IN REAM LEVER	5/16 @ 0.0047 1/16 ACCEL REAMING CAMS	180 193	C'BORE C'BORE BUSHING ACCEL REAM ATTACH FLAT-FORM TOOL FLAT-FORM TOOL FLAT-FORM TOOL HOLDER FLAT-FORM TOOL HOLDER	191 192 ST'D 194 195 196 197
POS 4 — TAP 1 11/16 -18 NEF-2 LH FORM TAPER AND BREAK CORNER	THREADING CAM	198	UNIVERSAL TH'D ATTACH (SPEC LENGTH SPINDLE) TAP LH TAP HOLDER FLAT-FORM TOOL HOLDER FLAT-FORM TOOL	ST'D 199 200 188 251

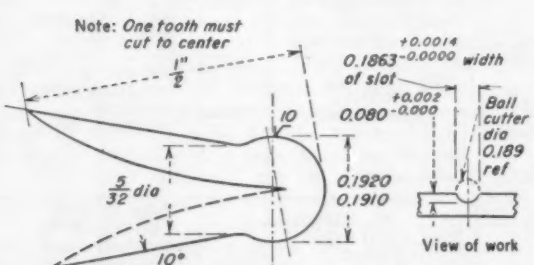


THIS FUZE-PART SLOT WAS TOUGH TO GET WITHIN TOLERANCES



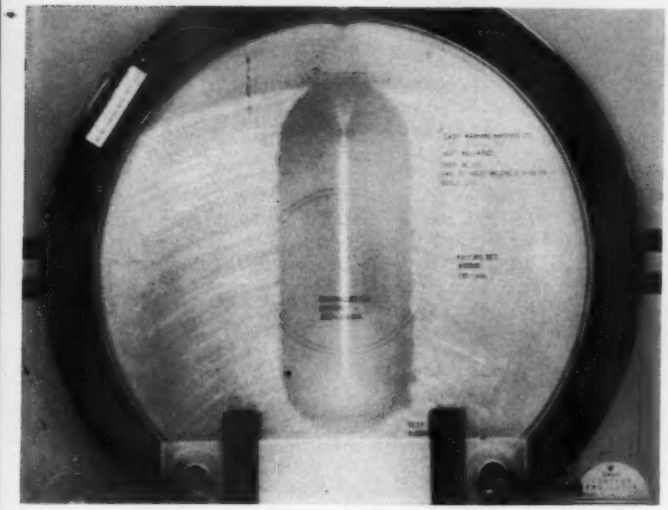
A HALF-ROUND SLOT at the bottom of a recess is not ordinarily tough, but this one is. The distance from slot end to an outer diameter 2 in. above it must be held within 0.005 in., the slot must start close to the junction of inner wall and bottom, go exactly toward center, and slot-depth tolerance is 0.002. Material is C-1117. The answer is ball-end milling, done two at a time in a Heald 121 Bore-Matic. Boring heads are set at 10° angle with work axis to permit a 10° taper on cutter shanks for strength. Had boring heads been set parallel to table travel and work centerline, then tool-shank diameter could be only 3/16 in. for first 1¾ in. of length, giving an unfavorable length-diameter ration of 9.3 to 1

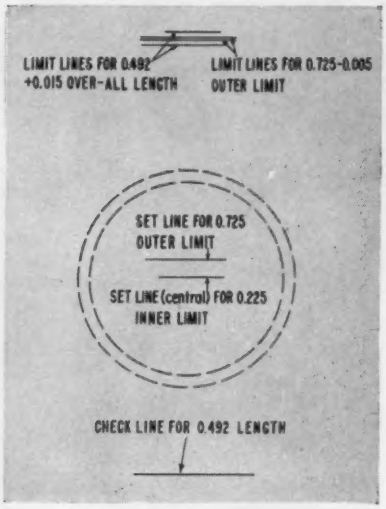




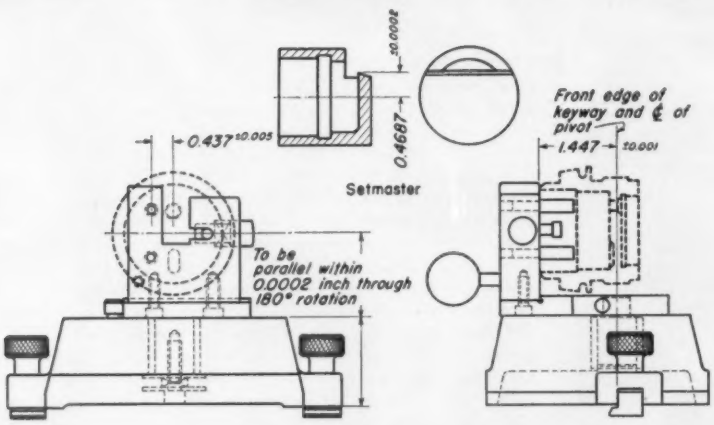
TWO HYDRAULIC CLAMPING FIXTURES on the cross slide hold the work, which is located on diameter and a two-way pin in a hole and adjacent face. A pushbutton clamps work, table automatically travels left at rapid traverse, slows to bore, cross slide makes contact, feeds forward, makes second contact, sends table right at rapid traverse to rest position, automatically unclamps fixture and resets cross slide to rear. Special cutter (sketch) in 44A Carboloy, made by Pratt & Whitney, produces about 6000 parts total with four regrinds. It operates at 6000 rpm and 0.0008 ipr feed. Cut is made from the outside in, and position tolerance of 0.002 in., as well as depth tolerance of 0.002 in., are maintained easily

AND AFTER SLOTTING, WE HAD TO WORK OUT A SPECIAL INSPECTION SETUP

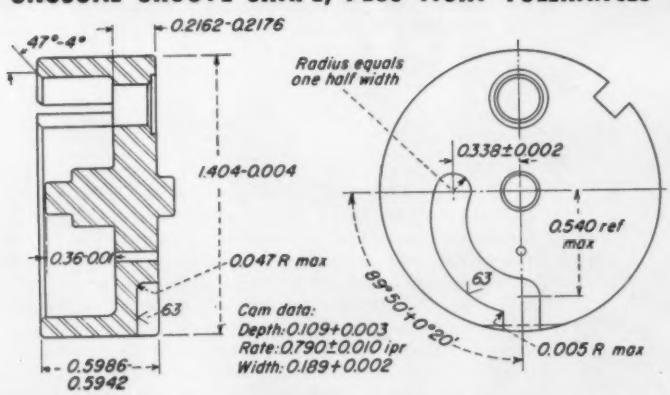


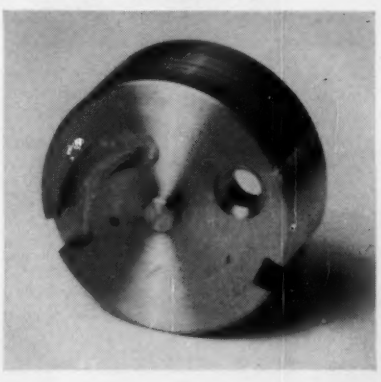

LIMIT LINES FOR 0.492 +0.015 OVER-ALL LENGTH
LIMIT LINES FOR 0.725-0.005 OUTER LIMIT
SET LINE FOR 0.725 OUTER LIMIT
SET LINE (central) FOR 0.225 INNER LIMIT
CHECK LINE FOR 0.492 LENGTH

SLOTS are not only difficult to cut, but also difficult to inspect. Mechanical gages originally provided were not sufficiently accurate. The final method involves an Eastman optical projector (photo) with special setup to reflect a 20 to 1 picture of the slot on a screen by surface illumination. The screen (sketch) carries tolerance limit lines which can be set to a master (fixture sketch). Then slot length can be checked (0.015 in. tolerance, two inner lines) and slot-end position (0.005 in. tolerance, two outer lines). The same unit also enables a check of surface finish because of the enlargement, and of the chamfered edge on the counterbore



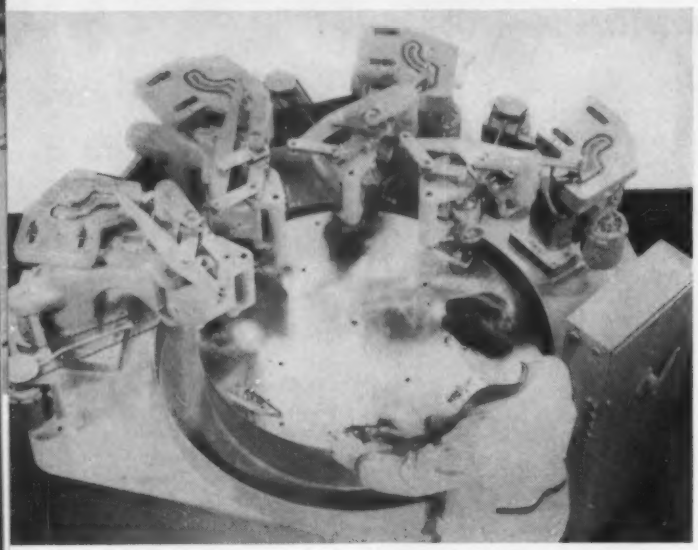
AN UNUSUAL GROOVE SHAPE, PLUS TIGHT TOLERANCES FORCED A TRICKY SOLUTION



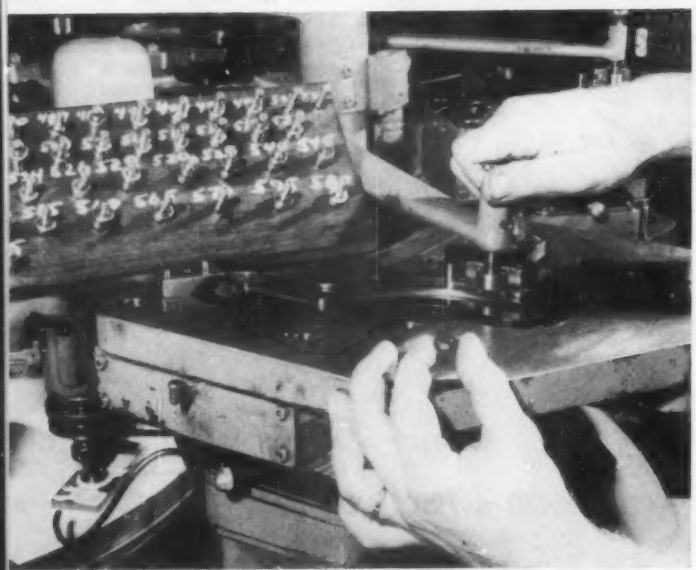


FLATTENED S-CURVE SLOT in this 1213-steel fuze component is difficult because of close tolerances in width and finish, but the 0.189-in. slot width has been the major headache. First methods developed were based on single-pass milling, which could not hold slot width closer than 0.005 in., usually meant one rough wall, and prohibited cutter resharpening, because slot width is set by the cutter. Slot must be located with respect to the center pin and the hole on the far side within 0.001 in., must be within .0015 in. for depth, and have bottom and side surfaces to within 63 mu in. rms (although no equipment is available for measuring surface finish of a curved inner surface, comparison is made by standard finish block. Slot width tolerance is only 0.002 in. All of these must be reduced by tolerances on finishing. For example, width machining tolerance of 0.002 in. shown on the print is actually only 0.0015 in. because of tolerance of 0.0001 in. for cadmium plate, 0.00005 in. for Parkerizing, and 0.0001 in. for Electrofilm (a moly disulfide dry lubricant baked on) per side. Easy Washer decided upon a machining method utilizing a smaller cutter with 360° trace so slot width can be adjusted exactly. Close tolerances also suggested some tracing device with a reduction from the master to reduce effect of variations from any cause

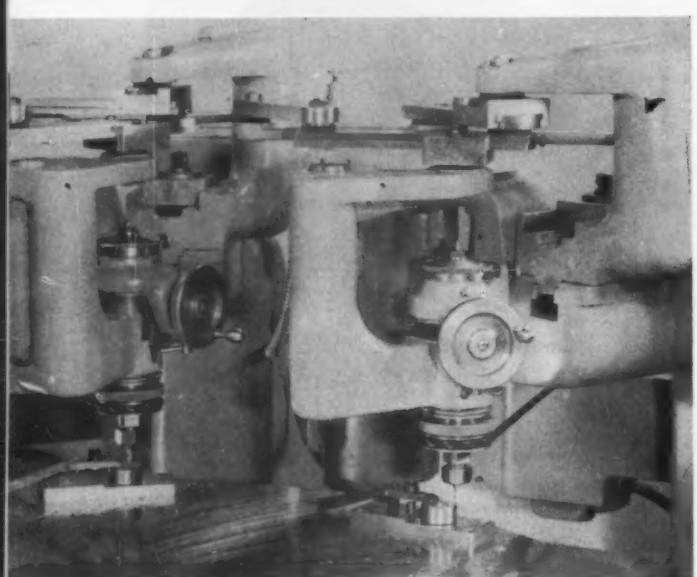
(NEXT PAGE, PLEASE)



THREE METHODS are currently in use by various contractors for producing the slot: profile milling with a multiple-spindle duplicator, contour boring, and semi-automatic pantographic engraving. All have been compared by Easy. Profile milling is about 2½ times as expensive as the others, offers 214 pph with one-side trace, but gives only 12-24 pcs per cutter and will not hold tolerances on slot width except with 360° trace, which cuts output in half. Contour boring with carbide cutters also causes slot-width-control difficulties, is hard to control on finish, and about 15% more expensive than the one finally selected. A special 4-spindle Gorton pantographic engraver with Avey geneva-motion table was cheapest, more readily adjustable for slot width, and faster. It has a gross potential of 420 pph, can hold 35 mu in. rms on sides and bottom (63 mu in. required), side tolerance within 0.0016 in. and depth within 0.0015 in. Rejection rate is under 1% with 100% inspection. Parts are roughed at two stations, finished at two others, roughing requiring 15 sec (including 2-sec index) by conventional milling, finishing 13 sec (including 2-sec index) by climb milling. Output is currently 210 pph because of close tolerances; this could be increased 20% by easing slot-width tolerance to 0.005 in., as requested by other contractors (request turned down by Army Ordnance). Spindle speed is 4300 rpm, with 0.001-in. chip per tooth (3-flute cutter). Operation is semi-automatic, the operator pushing a button to start each indexing cycle

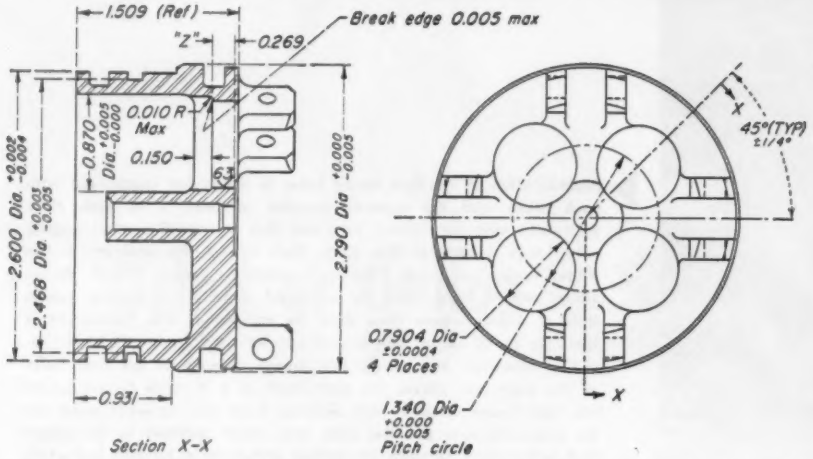


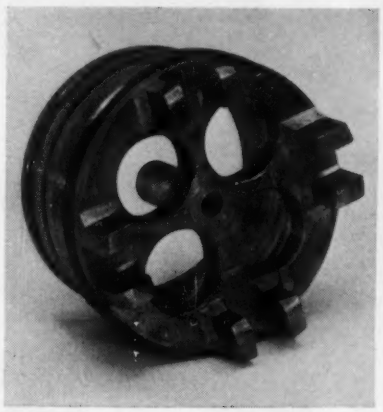
VARIATIONS were made in the Gorton tracer control to arrive at close tolerances with 360° trace. Note the slots in table holes for small screws; these permit tightening the trace drive chain to remove play. Trace direction can be reversed by the upper lever on the side, speed can be changed by the lower one. Cutter depth is adjusted by a handwheel on the spindle head which reads to thousandths. To adjust slot width and to compensate for wear, the stylus guide roll can be changed in 5 seconds. The holding screw on the arm is loosened and the tracer pin lifted so the roll is released. Some 20 rolls are available, in 0.002-in.-dia steps, giving 0.00025-in. steps on the cutter because of the 8 to 1 ratio between stylus and cutter arms. Cutter wear shows up in narrowing slot width or burring, either detected at once by the inspector. She receives finished parts, two at a time, in the same order as they are taken from the fixtures. Thus she can identify the offending cutter. She has a go-no go pin gage for slot width, a fixture with dial indicator for slot depth, and a bar gage to check slot start position. Every slot is checked for width, every fourth or fifth gets a complete check. As soon as a cutter begins to cut a narrow slot, the inspector tells the operator, who changes to a larger stylus roll. Frequent roll changes or burrs indicate the cutter must be changed



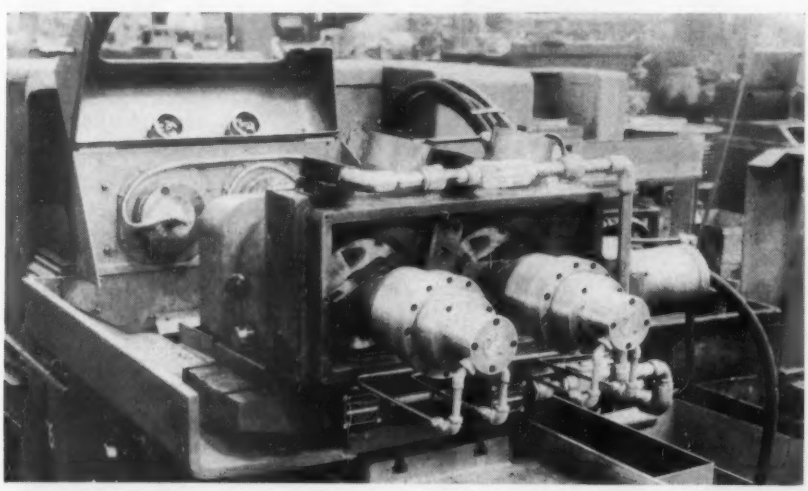
THE PART is set on a plug which locates at three points: on the center pin and the hole across from the slot (0.001-in. tolerance on each), and on the inside top surface. This makes for a simple fixture and easy loading, but requires surrender of half the 0.003-in. tolerance on slot depth, because thickness tolerance is 0.0015 in. on the top wall. Parts are held by a sliding fork lever, with a cam lock. The table indexes two stations clockwise, so the two left spindles are roughers, the rights finishers. The fixture is set at an angle to the table rim to clear cutter spindles in indexing. Various cutters have been tried, 2-, 3-, and 4-flute, as well as carbide. Best is HSS 2-flute, which cuts 350 parts as a finisher, then 350 more as a rougher. Thus far they have not been reground because of problems with slot width and wall finish. Originally short to prevent deflection, cutters can be cut off once (0.109 in., the slot depth), thus will give 700 parts total in each operation. The rougher cuts 0.0025 in. under desired width on each side (0.005 in. narrow) to leave stock for finishing. Closer roughing results in rapid finisher wear from inadequate chip loading. Best cutting fluid thus far is a 30-1 mixture of Stuart's Dasco Super-soluble oil. Two Gorton machines are currently in use; the machine has been nicknamed "The Mechanical Octopus" because of the multiple pantographic arms

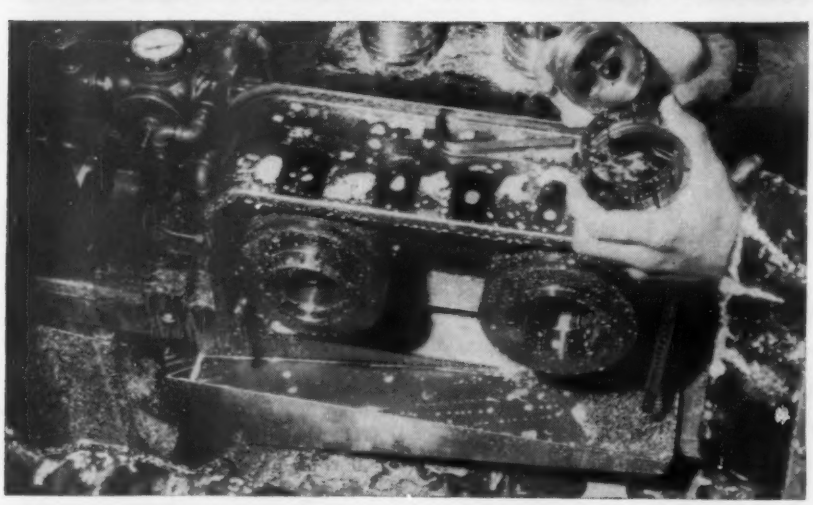
FOUR HOLES TO BE KEPT IN LINE REQUIRED A SPECIAL BORING FIXTURE





THIS ROCKET COMPONENT of C1117 steel has easy bore and depth tolerances, but the four holes into which other parts must make a gas-tight fit are extremely close, both in diameter and in perpendicularity with an annular outer surface. No drag marks or taper are permitted. The component itself is produced with ease on a bar automatic and holes rough-drilled in a Natco, but it was decided these holes had to be bored to high accuracy. The upshot was to use a Heald Bore-Matic Model #321 with an elaborate fixture that actually cost more than the machine tool. A boring bar with three bits of 78 Carboloy bores, counterbores, and chamfers the hole simultaneously. By cutting both in and out, the boring tool leaves no drag marks, bores a 0.7904-in. dia. ± .0004 at each of four indexes to 63 mu in. rms finish. The 0.870-in.-dia counterbore must be concentric with the main bore within 0.006 TIR, the axis of the bore perpendicular to one side wall of a 2.468-in. outer diameter within 1/20° (at this radius 0.0014 in.) and the base of the counterbore parallel to the OD wall within 1/10°

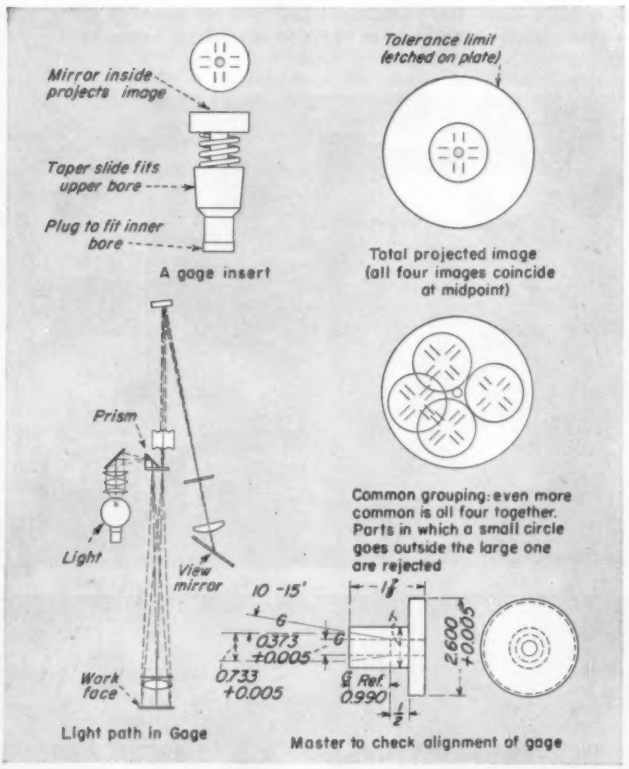




TWO BORES ARE MADE AT ONCE, with parts held in air-operated collet chucks. Extra split sleeves are provided so parts can be put in the spares during the machining cycle. Radially, the part is positioned by a pin in one of the four slots, and the part end stops on the rear counterbore. The chuck body has an interference pin for foolproof loading: the operator must push the loaded split sleeve into the collet while clamping. With stations loaded, the operator starts the cycle by pushbutton. As the table rapid-traverses in, it starts heads rotating at 2500 rpm. As work approaches tools, table feed is lowered to 0.004 ipr. Reversal at bore completion is automatic for boring out. Rapid traverse after the bore is completed takes the table out to the center stop. There a Microswitch reverses hydraulic pressure in the index cylinder (far right) to rotate both fixtures 90°. Then another Microswitch returns the index arm, while others start table feed again. This cycle continues automatically until all four holes are bored, the heads returned to No. 1 position, and the table taken past the center stop to loading position, while heads stop. Stock removal is 0.025 in. per side (variation 0.012 in.). Originally, less material was left for boring, but tolerances could not be maintained until tools were required to take an adequate cut

PARALLELISM of the four bored holes in the rocket component with each other and the exterior annular surfaces is to such close tolerances and so difficult to check that a special optical gaging setup was necessary. The gage that solved the problem is the Hilger Projection Angle Dekkor, a relatively recent English device which reflects light from the mirrored surfaces of gaging inserts onto a screen where they may be compared. The instrument is accurate to 10 sec of angle and can be used by a relatively unskilled operator. She merely sets inserts in each of the four holes of the part and places the part itself in a V-guide fixture under the light beam. Location nor distance from lens to work need not be exact, because parallel light rays strike surfaces to be gaged and reflect back through an optical system to a hooded indicating scale or screen about 3 in. square. The operator sees a ring, which represents the maximum allowable deviation from normalcy, and four smaller rings, one each for the inserts in the bored holes. The relationship between the two indicates whether the part is within tolerance (see sketches below)

AGAIN THE PROBLEM OF GAGING—AND AGAIN WE USED OPTICS


Mirror inside projects image
Taper slide fits upper bore
Plug to fit inner bore
A gage insert
Tolerance limit (etched on plate)
Total projected image (all four images coincide at midpoint)
Common grouping: even more common is all four together. Parts in which a small circle goes outside the large one are rejected
Prism
Light
View mirror
Work face
Light path in Gage
10 -15°
0.373 +0.005
0.733 +0.005
Ref. 0.990
2.600 +0.0005
Master to check alignment of gage

OPTICAL SYSTEM of the gage is important to an understanding of why neither exact location nor lens-to-object distance are necessary in gaging. Here also are shown a gaging insert, the master with which gage alignment is checked, and two possible patterns of images. Unless all small images appear within the large one, the part is rejected. Originally, some effort was made to straighten bent bores to salvage the piece. A little study of the gage pattern indicates which bore is at fault, so they could be straightened readily. However, within 24 hr the piece had returned to its original shape, so now out-of-tolerance pieces are simply scrapped

Only dimensions essential to the story are shown on part drawings; others are deleted because these are products for National Defense. The entire story and our front-cover photo were cleared for publication by the Department of Defense, Army Ordnance and Navy Bu Ord.

Round Table

Grind or Gallop?

"I'm trying to talk one of my boys into taking the toolmaker's apprenticeship course, Ed, and I'm having a tough time convincing him."

"I can see why you would, Al. The pay is low, the course is long and tough, and toolmaking isn't as snooty a profession as it once was."

"Maybe we could get Management to up the pay a bit."

"Not a chance, Al. They've worked on that, and there just isn't any justification for paying an apprentice regular wages. He isn't worth it until he's completed the course."

"Doesn't seem fair to me, Ed."

"No student in any line gets top pay, Al. Why should a student toolmaker? He can't make tools until he finishes his four years—at least nobody around here would trust him to make tools until then."

"We lose a lot of good men because of that, Ed. Some of them quit and go to work in other plants as toolmakers."

"Well, they can have them. The ones who finish here are really toolmakers, Al. We have a good toolroom: We don't have to send out for anything if we don't want to. The reason is a good, tough apprentice course that weeds out all the bums and the kids that aren't serious."

"If the other plants can get some good out of our apprentices, it seems to me that we're wasting talent."

"They don't get that much good out of them, Al. Besides, it costs them more than they probably think it does to use those guys. They waste material, tools, and time; actually, they probably aren't worth much until they've put in the same time they would here."

"Well, at least the students are ahead because they make regular wages during the time they're practicing."

"Not really, Al. They never turn out to be balanced toolmakers—they're more likely specialists with a lot of weak points."

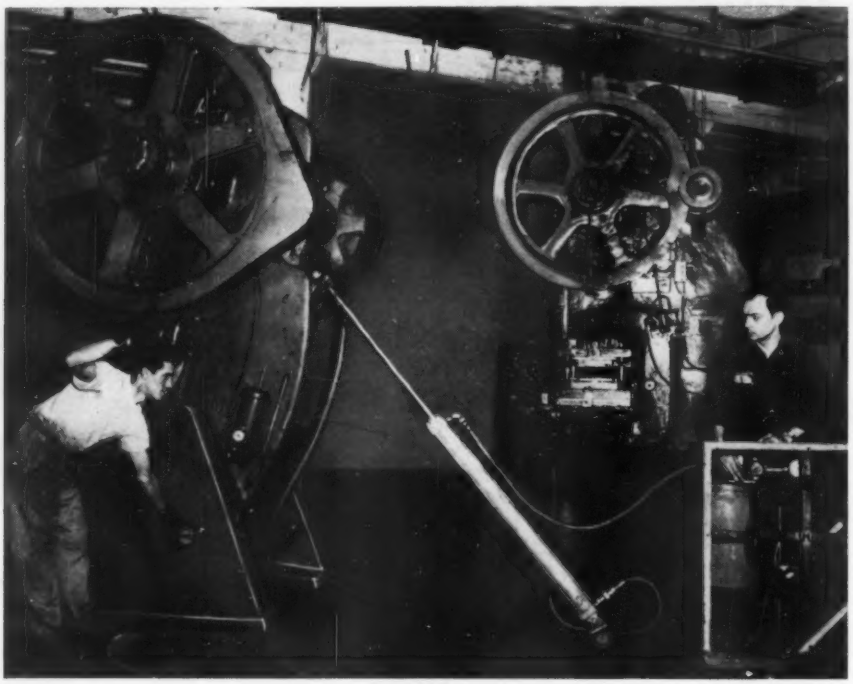
"I still think the company ought to subsidize the apprentice course. It would be worth it to keep the students happy."

"Don't think they're not subsidized, Al. They aren't worth hardly anything at all for a long time, and the company pays them more than half what they'd make on machines."

"It's a rough deal, all the same, Ed."

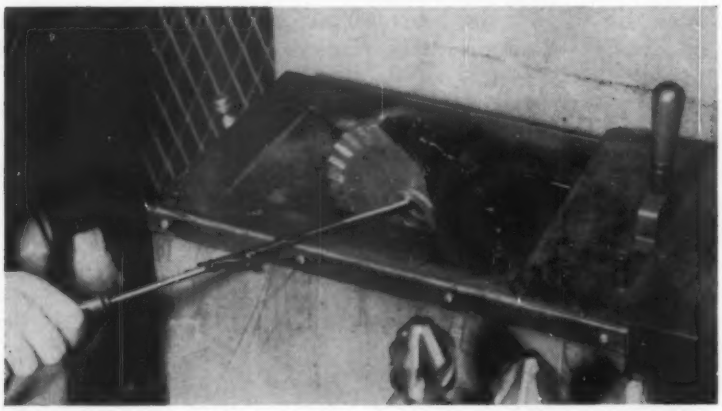
***SHOULD APPRENTICES** be paid and given attractive deals to keep them learning, or does a tough time get rid of those who aren't going to be top-notch men? Does a tough course assure you that the men who finish will be top-notch? Your opinions can help others. Discussions of earlier topics start on page 188.*

SHOP SHOTS



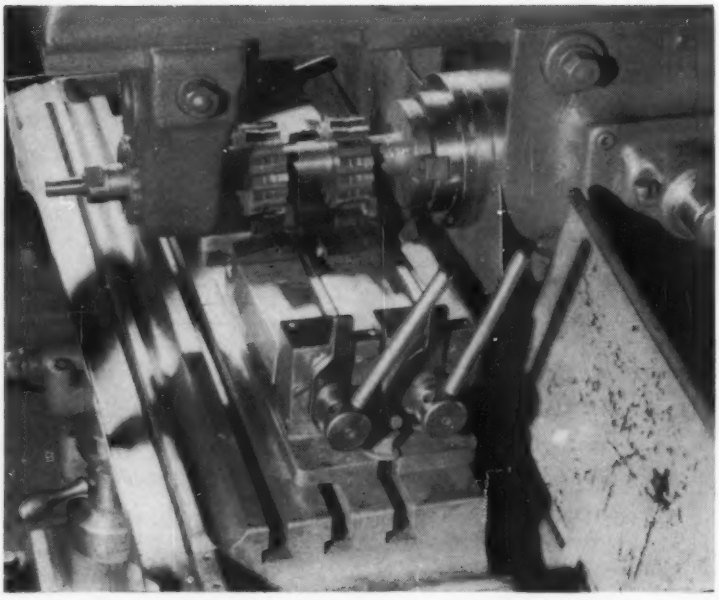
One man tilts punch press . . .

. . . with aid of shop-designed hydraulic unit. Ram has 40-in. stroke, 2½-in. bore, and is controlled from cart by ⅜-in. needle valve. Power cart has motor, pump, and reservoir. Ram is placed between bracket welded to press back and matching bracket sunk in floor behind press. Whole thing cost $360, lets setup man handle up to a 90-ton press and get it into production again in 10 min. *Viking Air Conditioning, Cleveland*



Cutters are hot-dipped . . .

. . . in butyrate peelable plastic after inspection, regrinding, and final inspection. Plastic coating prevents rust and shock damage to tools and gages until they are installed on machine. Operators know tools and gages have been checked if they are coated; otherwise they send them back to the tool-grinding department. *Carrier Corp, Syracuse, N Y*

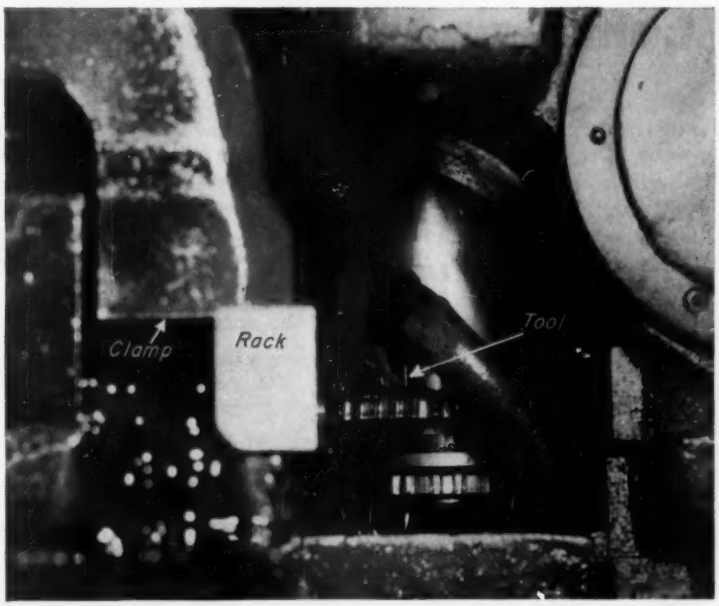


Shuttle milling doubles output . . .

. . . of bumper pads for typewriters. Two fixtures on miller table hold two parts each, clamped alternately while other part is being cut. Rate is now 2400 per 8-hr shift; used to be 1280. *Remington Rand Inc, Elmira, N Y*

Rack shaping beats milling . . .

. . . when teeth on lathe rack are cut. Three 18-in. rack blanks are clamped on Fellows shaper table by 9 screw clamps. Up to this point, rack blanks have been shotblasted, Magnaflux-inspected, milled, heat-treated, shotblasted again, straightened, and ground. *Monarch Machine Tool Co, Sydney, O*



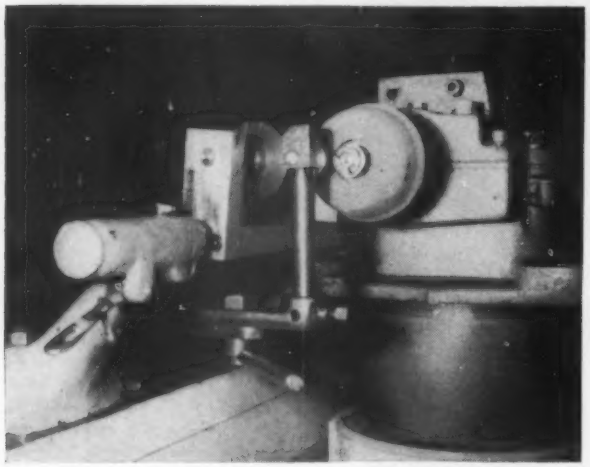
Shaper cutters work up and down . . .

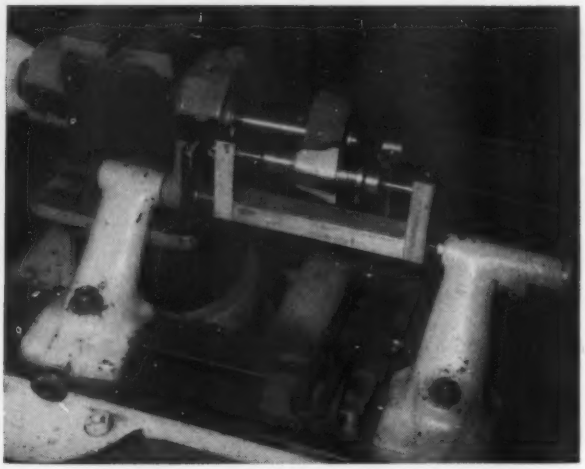
. . . and rotate as rack blanks (white spot, left center) are fed past at same speed as cutter OD. Monarch shapes its own to maintain quality control. Each rack will have 48 teeth of 8 DP, 20° pressure angle. Following steps are flame-hardening the teeth and straightening the racks again. *Monarch Machine Tool, Co, Sydney, O*

Typewriter racks are form-ground . . .

. . . with crush-dressed wheel, 80 at a time, which is more economical than milling. These are margin racks, soft steel, and have 100 teeth each. Output is 2500 per day, with 3 loads per wheel dressing. Hardened letter-space racks are ground with 120 per grinder load, at 6 loads per wheel dressing, and 2100 pc per day. *Remington Rand, Inc, Elmira, N Y*

Practical Ideas . . .





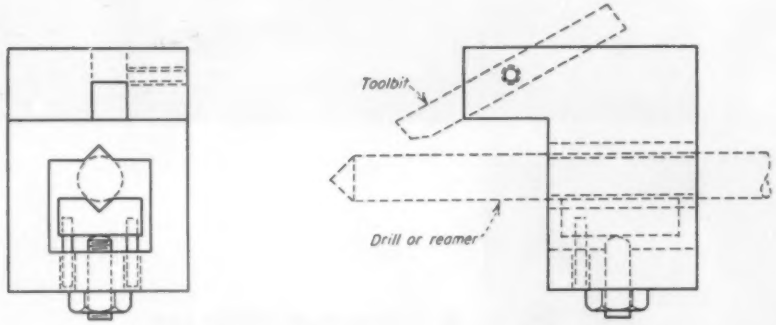
Cam-Grinding Attachment Relieves Cutters

The cam-grinding attachment shown here was inspired by your recent article on grinding non-cylindrical forms. The fixture is very simple, and easy to use.

The form was crushed into the grinding wheel, using the soft blank. Then the cam was hand-filed from a disk to layout lines.

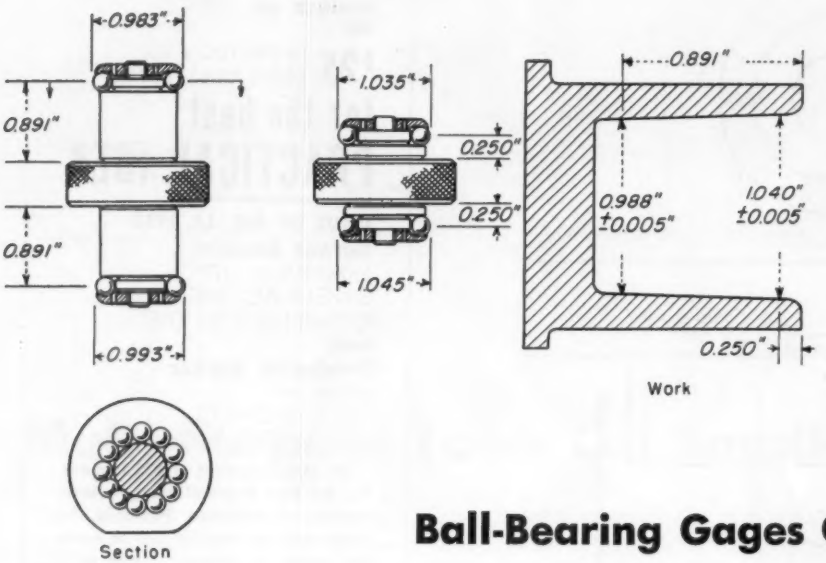
In use, the cam was held against the follower by hand pressure, and the shaft with the cutter was rotated by hand. (The follower was supported by standard tooth-rest brackets.) A spring to hold the cradle against the roller-follower was found to be unnecessary for the one piece.

The fixture shown here is basic and simple, but could be improved on if desired. For example, a one-lobe cam could be used, with some means for indexing the work, and a cylindrical grinding attachment could have been used to rotate the work. *A A Sinisi, Mount Vernon, NY*



Combination Tool Drills and Chamfers

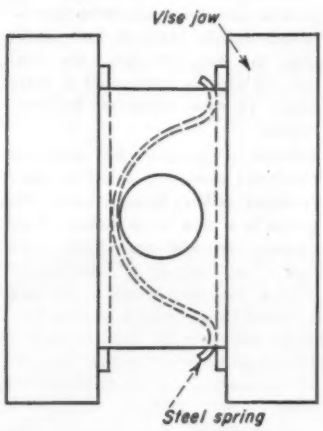
This auxiliary toolholder can be made to clamp on several sizes of drills, reamers, or boring bars. The toolbit can be ground left or right, to chamfer inside or outside corners, or can be ground to turn the OD of work which is being bored, drilled, or reamed. The tool can even be used as a depth-stop by replacing the tool with a rod which presents a flat surface to the work. *Walter Fivecoat, Indianapolis, Ind*



The two gages shown here were used to check both ends of a tapered bore to the dimensions indicated on the work. The gages are quite simply made, with nothing more than standard shop equipment. The object of using the steel balls is that they can easily be replaced when worn, and the gages will be restored to their original size.

This design avoided the difficult machining and checking required when making the gage with a cylindrically-ground end. *G R Milner, Lincolnshire, England*

Ball-Bearing Gages Check Tapered Bore

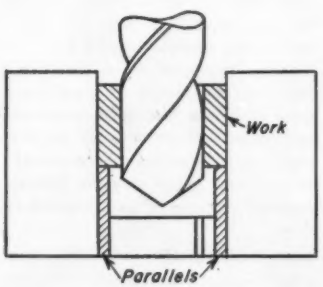


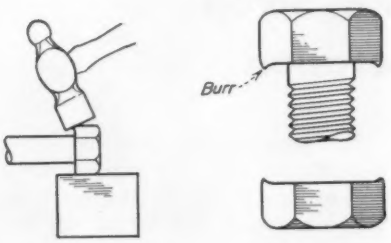
Spring Steel Separates Parallels

When drilling a large hole in narrow stock, thin parallels must often be used to support the work. These parallels are not too stable, and occasionally fall over during drilling, which can cause a scrap piece and a resharpening of the drill, if it happens to hit the parallel.

A simple but effective remedy for this is to form a thin piece of spring steel as shown. This spring is then placed between the parallels, preventing them from falling over. Because of the spring action, one separator may be used for several stock widths.

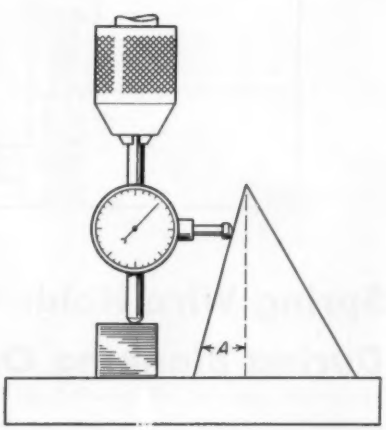
If the size of the hole does not permit the parallel to pass beside the drilled hole, two separators may be used, one on either side of the hole. *Cliff Bossmann, Dayton, Ohio*





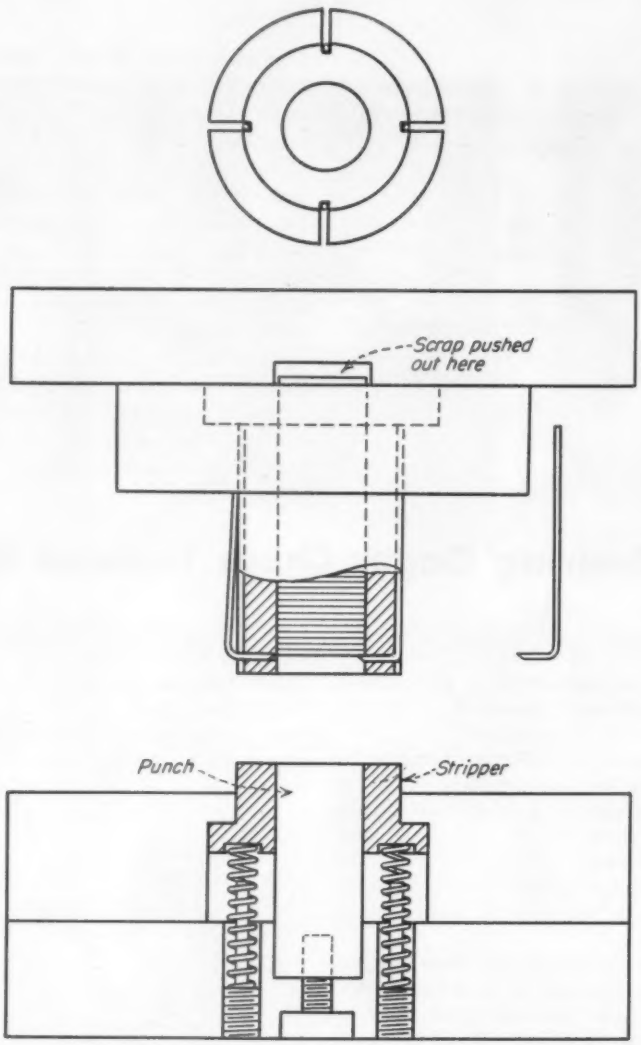
Dented Bolt Holds During Tightening

To secure a bolt or screw so it won't turn while tightening the nut with a wrench, strike the head of the bolt with a hammer. If it is hit near the shank, a dent or burr will be formed which will force itself into the metal as the nut is tightened. *Stanley Kopacz, New York, NY*



Size Block Aids Taper Check

To measure angles with a dial indicator, clamp the indicator to a bar held in the chuck of a drill-press. Bring the indicator against the taper as the bar rests on a block of known size. Then take a second reading with the block removed. The formula cot A = Height of block ÷ indicator-reading difference. *W G Sherman, Seattle, Wash*



Spring Wire Holds Thin Scrap During Blanking Operation

Shown here is one station in an 11-station combination die. This design was used to push the scrap from a piercing through the top of the die set. Originally, we had trouble because scrap from the piercing was dropping out and jamming the tool. To take care of this trouble we milled four slots in the punch, drilled four holes central with the slots, and inserted spring wire in these slots. The wire protruded into the hole about 0.005 in.

The punch in the bottom of the tool blanks out the round scrap and pushes it up into the hole. As the scrap hits the bevel on the spring wire, the four springs are pushed out of the hole. As the punch comes out of the hole, the springs move back in and hold the scrap from falling out.

Scrap moves up through the hole and is ejected through a slot in the top of the tool by a ram actuated by an air cylinder. *Dowd G Masterson, Hoxsie, R I*

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JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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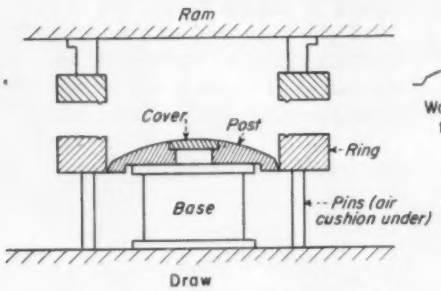
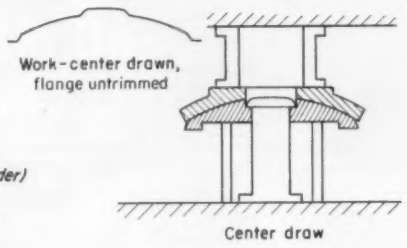
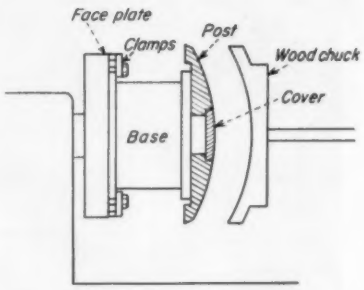
HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y







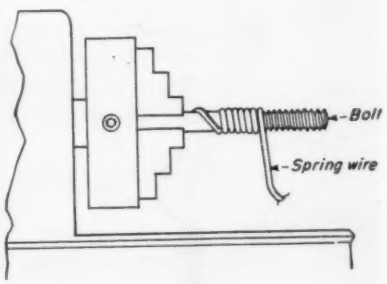
Multi-Purpose Tools Cut Small-Lot Cost

When making small lots of reflectors, we devised a method for reducing the cost of tooling without sacrificing accuracy or quality. The key to what we did is the use of the same cast iron "post" for several operations, on different machines. The first step is blanking out the work on a press-brake. Then the post cover is removed, and the center of the reflector is drawn. The post acts as a blankholder in this operation.

Then the post and base are removed from the press and clamped onto the faceplate of a spinning lathe, where the edges of the reflectors are curled and trimmed.

With this method, the post is used three times, the post cover is used twice, and the post base is also used twice, giving a considerable saving in cost of tools, compared to having separate tools for each step. Also, the work will fit the post exactly. *Juan Gotauco, Manila, PI*

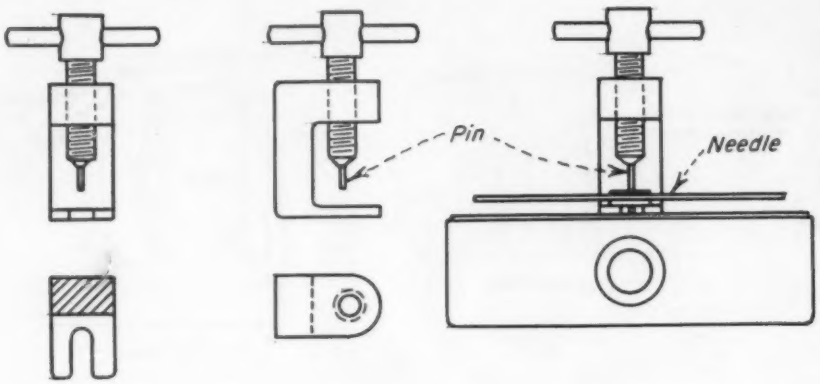
SCRATCH-ERASER, made from common ball bearing brazed to end of rod, and held in air drill. Revolving ball is passed over damaged skin, with light oil as lubricant. Tool saves 38% of time needed with conventional hand-burnishing methods. *Martin Aircraft Co, Baltimore, Md*



Bolt Serves As Spring Mandrel

We occasionally wind springs of various sizes, and find this method useful. Wind the spring on a bolt of appropriate diameter and pitch. Small springs can be wound with evenly-spaced coils when this method is followed. *Herbert Miller, Jersey City, NJ*

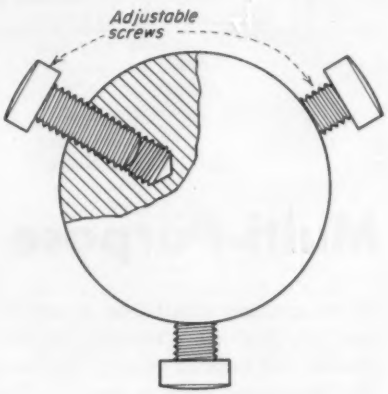
Ed note: And if you don't have a bolt of required pitch or diameter, it's easy to turn a blank to the right (corrected) OD and run a single-point tool along the work, making a groove deep enough to hold the wire in place.



Miniature Jack Lifts Needle

It is often necessary to remove the needle from a pressure gage, and trouble can result by using a screwdriver or knife for this purpose. Often either the needle or dial is destroyed. Also, the needle occasionally pops out of sight on the floor.

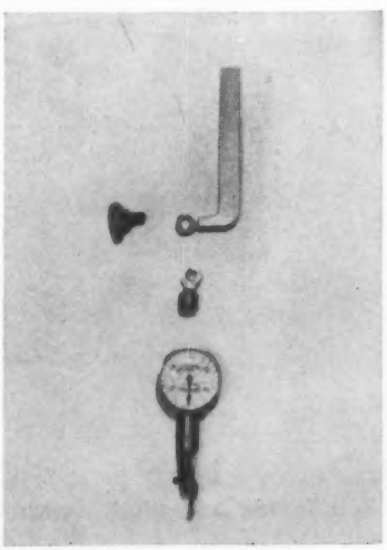
This miniature screw jack will solve the problem. The slotted plate is placed under the needle, and the thin end of the screw is put on the head of the axle. A few turns of the screw are enough to remove the needle conveniently and easily. *Carl Jensen, Copenhagen, Denmark*

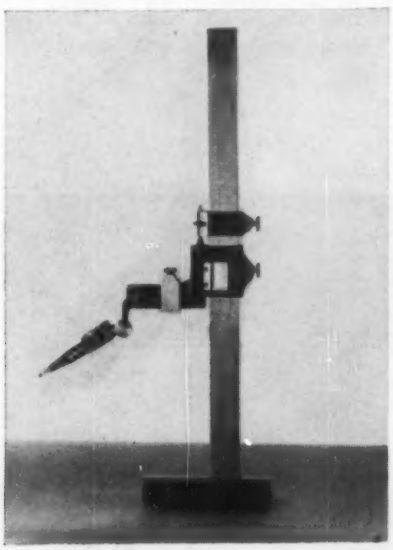


Adjustable Spider For Jaw-Boring

When holding close-tolerance work with soft chuck jaws, it is necessary to bore the jaws with a spider, and the diameter at which the jaws are held must be very nearly the same as the work, to get enough accuracy.

The device shown here is easily made, and serves as a spider for a wide range of work-sizes. The spider is a piece of bar stock cut off to a convenient length, and bored and tapped for three equally spaced setscrews. The size of the screws depends on the job, and the tops of the screws can be rounded off to hold more securely. *Raymond R Hale, Marlow, Okla*





Modified Indicator Makes Easier Height Gage Use

An easy modification to a dial indicator makes it more useful when gaging with a height gage.

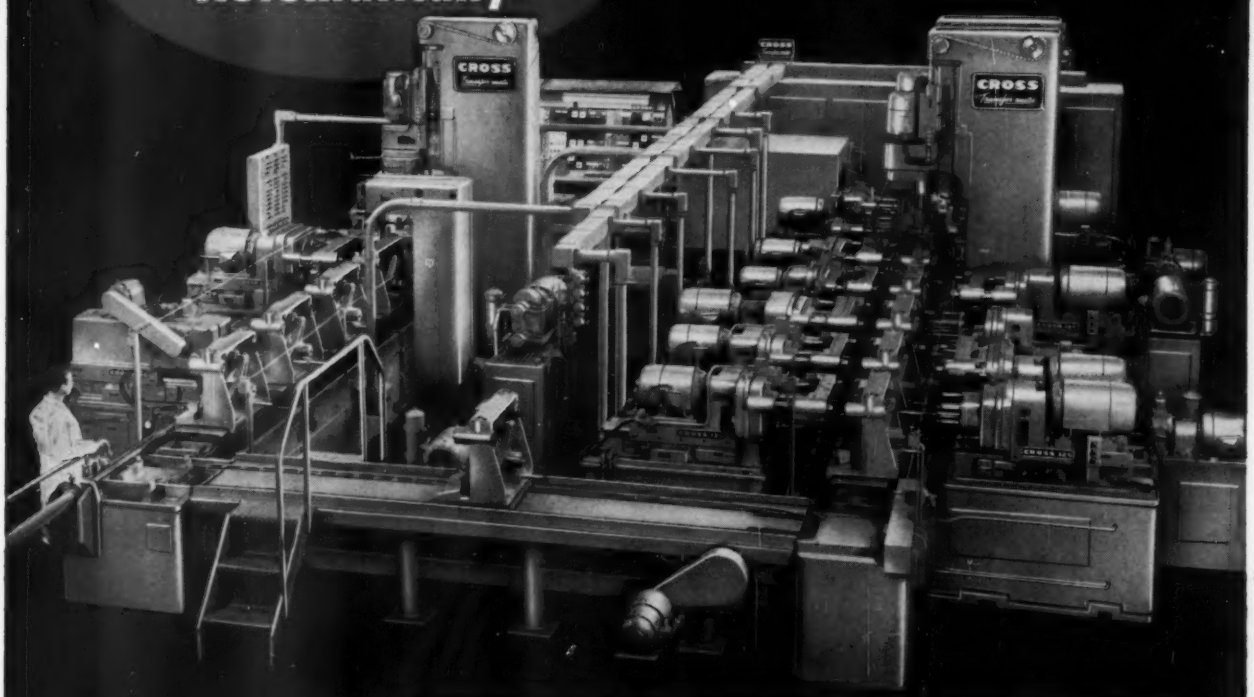
The dust cover is removed from the back of the indicator, and the crown is ground off. Then the threaded eyelet is silver-soldered onto the dust cap.

If desired, the cap and threaded part may be made in one piece, to fit the particular indicator you are using.

This arrangement is, of course, for those indicators which do not already have a ball-and-socket joint. *Joseph J Sanzo, Ilion, NY*

Machines Flywheel Housings and Changes Set Up Automatically

Another Transfer-matic by Cross



- ★ Completely machines (except for grinding three faces) flywheel housings for both standard and automatic transmissions.
- ★ Flexibility for scheduling because either part may be produced as required—set up changes and proper tools are selected automatically at each station.
- ★ 170 pieces at 100% efficiency.
- ★ 49 drilling, 22 chamfering, 4 reaming, 2 counterboring, 2 boring, 30 inspecting, and 30 tapping operations.
- ★ Palletized work holding fixtures with automatic transfer from station to station.
- ★ Hydraulic power wrench for clamping parts.
- ★ Other features: Complete interchangeability of all standard and special parts for easy maintenance; construction to J.I.C. standards; hardened and ground ways; hydraulic feed and rapid traverse; automatic lubrication.

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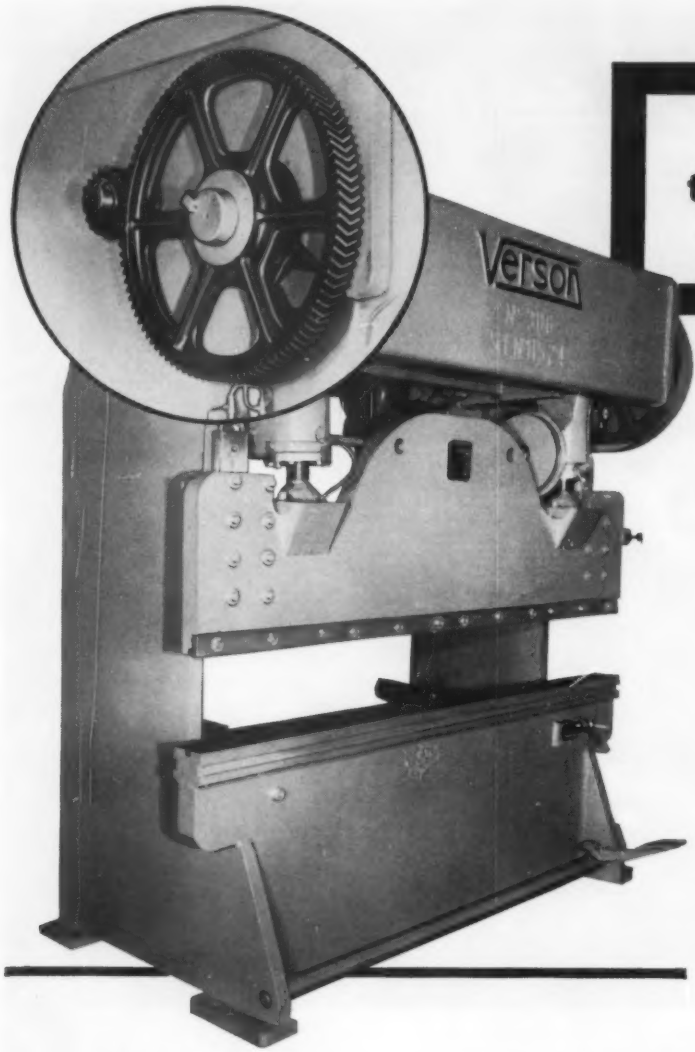

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American Machinist REFERENCE BOOK SHEET

INVESTMENT CASTING... I

CONTROLLING PATTERN SHRINKAGE One of the major troubles in making wax patterns for investment castings lies in the uncontrolled shrinkage of the wax during the cooling period, and the creation of sinks and draws. See Fig 1, below. For small patterns, this difficulty can be overcome to a considerable extent by injecting the wax at the lowest possible temperature and at pressures of 1500 to 2000 psi.

With larger patterns, however, satisfactory results cannot be obtained with low temperature and high pressure because the sectional area of the largest part of the pattern compares unfavorably with the sectional area of the injection sprue. The sprue will solidify before the pattern and draw will take place, with resultant distortion of the pattern. This difficulty can be overcome by locating a wax insert in the die cavity to even out the sectional difference between sprue and pattern, but this introduces the additional complication of insert manufacture and additional tool costs.

Additional disadvantages of low-temperature, high-pressure injection are the short life of the soft-metal dies under stress of high pressure, and the distortion of the wax pattern after ejection from the die.

An improved method of making larger patterns is shown in Fig 2, below. Wax is injected at a temperature 35 F above its solidification point and at a pressure of 100 psi; 30 sec after injection, injector is removed and air is applied at 100 psi; pattern is allowed to solidify, then air is turned off and pattern ejected.

This method produces a pattern free from draw and shrinkage, but still subject to thermal contraction which takes place after solidification and continues until wax reaches room temperature. The method is too slow for very large patterns, although the cooling characteristics of the die can be improved by circulating a coolant through it. This will not solve the difficulty created by the conductivity of a large volume of wax.

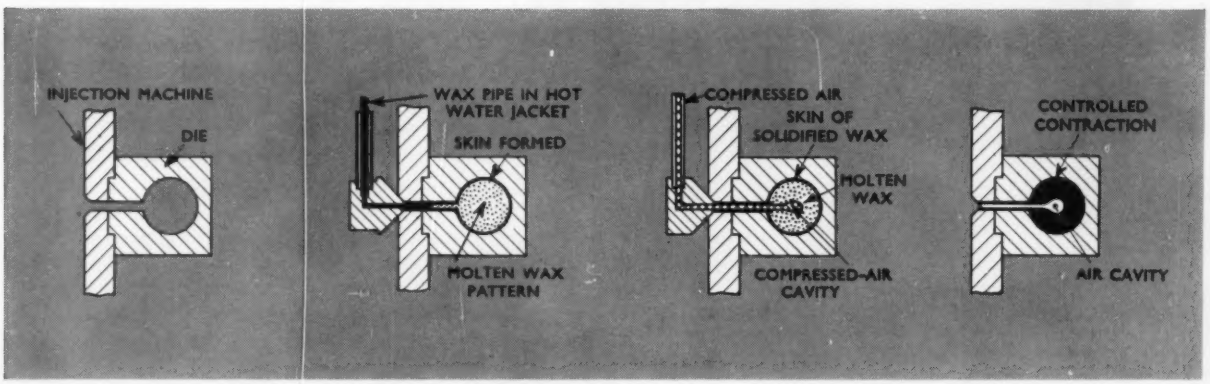

FIG 1

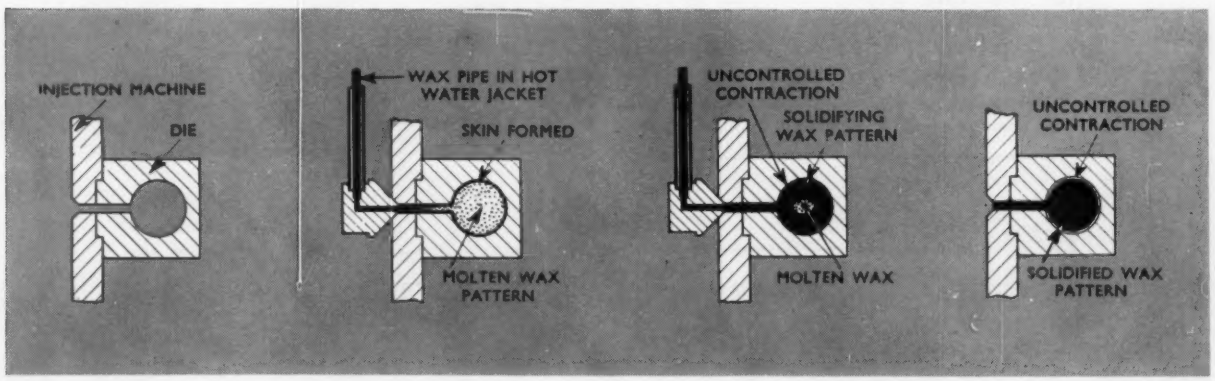

FIG 2

this double-ram vertical

LAPOINTE BROACHING MACHINE

with electro-mechanical drive

lends itself to carbide tooling because of its

higher speed ranges

here's BROACHING EFFICIENCY at its best!

Simultaneous broaching of rotor wheel slots and mating buckets (the latter requiring two progressive operations).

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125 broaching cycles per hour, at 80% efficiency, producing these parts faster than by any other known method.

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No loss through rejections, because all parts are formed perfectly and to the close tolerances required of jet engine components.

. . . that's quality production!

One operator easily and safely handles this double ram machine, loading one ram while the other ram is broaching.

. . . that's efficient production!

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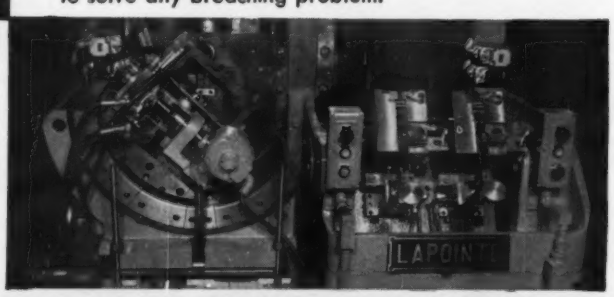
If you would like a description of this LAPOINTE double-ram vertical broaching machine ask for Bulletin **DRVE-2**



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INVESTMENT CASTING... II

LARGER-CASTING PROBLEMS

Where controlled contraction by means of compressed air will not yield satisfactory patterns because of the large size and the length of time required for cooling the large mass of wax, the method shown in Fig 3, below, will usually be found effective. A removable pin is installed in the mold on the side opposite the injection nozzle. Wax is injected at about 35 F above the solidification point and at a pressure of 100 psi. About 30 sec after injection, the injector is removed and compressed air is applied at 100 psi for from 30 sec to 2 min. The pin is then removed, permitting the wax to squirt through the pattern and emerge as a thin fiber. This leaves a hollow shell pattern which is quickly cooled by the air circulating through it.

Hollow patterns made in this way are faster to produce and are subject to far less shrinkage. Wall thickness can be controlled by the amount of time permitted to elapse before withdrawing the pin and permitting the fluid portion of the wax to escape. They may cause trouble with conventional investment techniques by collapsing under the weight of the investment, but they are well suited for use with the Investment X process, that will be described on page 159.

For complicated dies, excellent results can be obtained by casting the pattern under vacuum. The die is cleaned and coated with a parting medium, then closed by pressure from an air cylinder. An airtight housing is placed over the die and the air evacuated. Wax is injected under pressure through a slide valve. It is not necessary to inject compressed air into the die to eliminate contraction draw because of the vacuum exerted on the outer faces of the pattern. Excellent surface finish is obtained, but the process is slower than with conventional equipment.

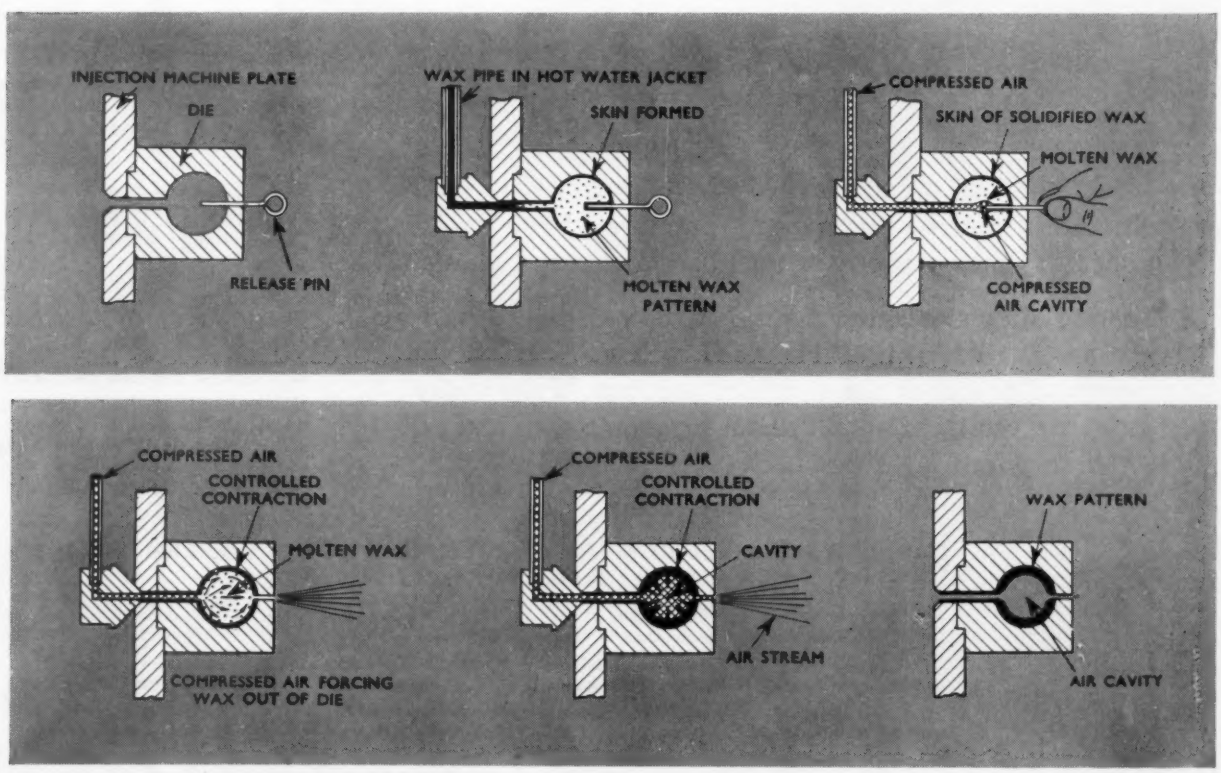


FIG 3

Yes

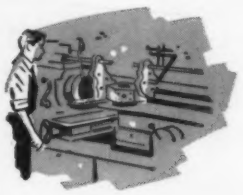
Leaded Steels Can Be Forged

This is our answer based on experience with many producers of forgings who have used leaded steels. Ledloy* and leaded alloy steels can be heated and forged in exactly the same manner as comparable standard steels.

No modifications in forging practices have been necessary is the report from users of leaded steels.

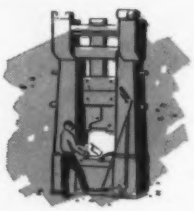
Leaded alloy steels and leaded carbon steels for forging are available in all standard or S. A. E. compositions and in any of our standard sections. Write today for complete information about application of leaded steels to your forged product.

*Inland Ledloy License



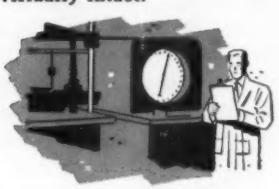
Are leaded steel forgings readily machinable?

Yes, the use of leaded steel forgings will result in the same improved machinability as is obtained in leaded steel bars.



Loss of lead due to heating?

Investigation has shown that the exudation of lead upon heating leaded steels is confined primarily to the scale. The lead content in the forging proper remains virtually intact.



Does lead affect mechanical properties?

No, the addition of lead does not materially affect the mechanical properties of forging.

Is there a health hazard?

Not generally. With ventilation normally required in forge shops, the use of leaded steels does not present a hazard.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY • STEEL DIVISION • WARREN, OHIO

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711 Prudential Building Houston 25, Texas	First National Bank Bldg. Jamestown, New York	7251 General Motors Bldg. Detroit, Michigan	3102 Smith Tower Seattle, Washington

For export—Copperweld Steel International Company, 117 Liberty Street, New York

American Machinist REFERENCE BOOK SHEET

INVESTMENT CASTING... III

INVESTMENT X METHOD

Similar in principle to a shell mold, Investment X molds are prepared by dipping a wax pattern in an ethyl-silicate bonded slurry, then showering with molochite in a stucco-rain machine. The coating is dried and the operation is repeated to build up a coating from ¼ to ½ in. thick. This requires from 6 to 8 dips.

Wax removal is effected in a solvent degreaser, using trichlorethylene vapor. If oven treatment is used, the thermal expansion of the wax will crack the investment. With solvent dewaxing, the solvent will permeate the porous shell and dissolve the wax faces adjoining the investment before the heat can expand the wax. A 15-lb wax pattern can be dissolved in 30 to 45 min. A particular advantage of this method of removing the wax is that, even if trapped in cavities and unable to drain by gravity, the wax-solvent solution will drain out through the permeable walls of the investment. The wax can be recovered by distillation of the solvent and reused.

CONVENIENT MOLD CHARACTERISTIC

For nonferrous castings, the shell mold may be fired and cast without further supporting media. For centrifugal pressure casting, the investments should be packed in Nimonic 75 boxes with a refractory mixture of sand and molochite, and fired at 1920 F. During the baking cycle the sand frits, converting a relatively fluid mold support into a solid which will easily withstand the casting stresses. When the mold cools to room temperature, the sand conveniently "unfrits," thereby changing the support from solid to fluid again. This eases the problem of knocking out the mold into a matter of pouring the sand-molochite mixture into a bin. The casting is then separated from the investment by vibration.

Particular advantages of Investment X are: no preparation, assembly, or stripping of mold boxes; no vibration needed; no drying oven needed, so danger of explosion is avoided. Slurry mixing is confined to preparing a single dip bowl, and handling and regrinding of mold materials is reduced by 75%. Shell molds are light, so handling presents few problems, and production per sq ft of floor area is two to three times that obtainable with solid mold methods. Mold breakage is substantially reduced, and the process can be carried by ordinary labor.

MOLD CRACKING AVOIDED

From a technical standpoint, dewaxing by solvent vapor gives a mold of consistent permeability; reduced thermal capacity of the shell reduces the chances of short-run castings and permits molds to be poured at minimum temperatures; and mold cracking is eliminated. Progressive solidification can be achieved by cooling parts of the shell before casting, by coiling heat-resistant tubing around local areas and blowing cold air through it. Because of the reduced quantities involved, it is practicable to employ first-class refractories and bonding materials, and hollow wax patterns may be employed which, with the solid investment process, would be liable to collapse. The unscientific disposition of a large number of patterns in a given volume, as required by the economics of the solid mold technique, is not necessary, and patterns can be disposed symmetrically around the main runner. The shell molds are of identical structure on all faces, whereas a solid mold has a weak surface on the underside of the pattern because of the difference in vibratory packing.

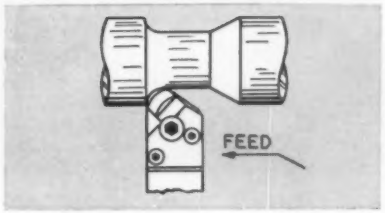
WAX PATTERN is dipped in ethyl-silicate-bonded slurry. Rotating bowl and stirrer maintain consistency of slurry

CERAMIC SHELL is showered with molochite in a stucco rain machine. Dipping and showering are repeated to obtain desired thickness.

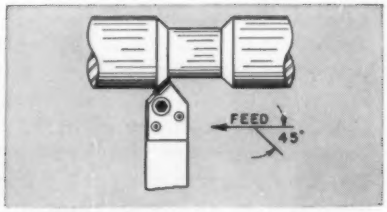
AFTER BAKING and pouring in centrifuge, sand-molochite backing material unfrits and can be poured out of the Nimonic box

YOU CAN DO 90% OF YOUR MACHINING OPERATIONS WITH NINE STYLES OF V-R TOOLHOLDERS PLUS "THROW-AWAY" BLANKS

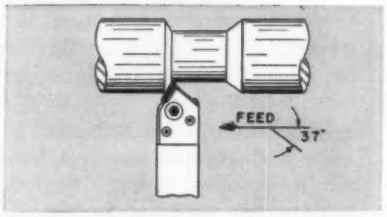
. . . at Savings of 50% to 200%



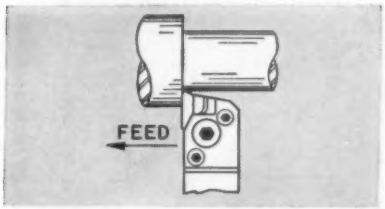
New RBR For turning, facing or plunge cutting. On large diameters the RBR makes an excellent boring tool.



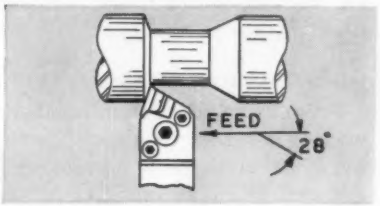
NEW TER With 45° lead angle for plunge turning, straight turning and chamfering.



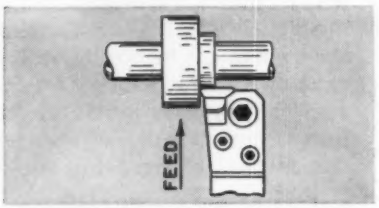
NEW TDR For plunge turning, straight turning, chamfering, and facing at 30°.



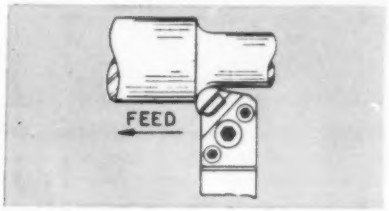
TAR For turning to a square shoulder with triangular inserts.



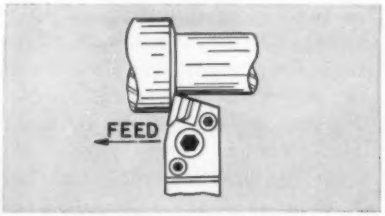
TBR For plunge turning with triangular inserts.



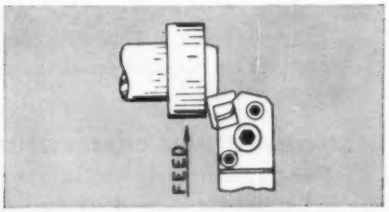
TFR For straight facing with triangular insert.



RAR For straight turning, facing and chamfering with a round insert.



SBR For straight turning, plunge feed turning, vertical turning, facing and chamfering.



SFR With 15° lead angle for vertical turning, facing and chamfering with square insert.

All V-R Toolholders Are Designed So They Can Be Ganged for Multiple Tool Set-ups.

All V-R Toolholders are available in right or left hand styles. All styles are available for either "Throw-Away" inserts or standard 1½" inserts. Write for the New V-R Toolholder Catalog VR-435B with New Low Prices.

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Makers of the World's Finest Carbide

Talking Shop . . .

Wired Wireless

LOCKHEED HAS SUPERIMPOSED onto the wires of its public-address system at Burbank, Calif, a 2-way talk intercom system to expedite material flow. There are three central stations, each with master control panel, which tie in directly with 30 transmitter-receiver units at stations in fabrication and subassembly shops. From a master station, a production coordinator can ring any or all substations in the area by selective ringing (each substation is tuned to a different frequency). Substation operators can check the item in question on their own workcharting boards, then reply directly to the master station without being heard at other stations. In 16 months of use, costly delays in locating shop orders have been eliminated, emergency or critical orders have come under close control, and issuance of instructions has been simplified. Savings are $100,000 a year. Any number of substations could be tied in. The system is a variant of radio called carrier-current communication, by which signals are sent out on wires (even a barbed-wire fence could be used) instead of being broadcast over the air. It was worked out by Lockheed engineers, uses an hf carrier current, and does not affect the public-address system in any way.

Boom Anticipator

LATEST GADGET for storage tanks, planes, etc, is an electronic device that "sees" an explosion almost before it occurs, then acts in a split second to put it out.

"Bulk Picking"

IF YOU ARE INTERESTED in the growing opportunities for automatic assembly, as we are, you may be interested in a new warehousing system developed by Walter Kidde Constructors, in cooperation with Link-Belt and Teleregister. A card is punched for each item on each order. Cards are sorted by items and sent to the pickers, who put the number of items specified on a monorail carrier along with the card. Pickers receive cards for the same or adjacent items, so keep legwork to a minimum. The monorail carrier switches the load to the assembly station for that order. This can be done either by a dispatcher who punches the order code on a panel on the carrier or by an automatic card reader.

Give you any ideas?

Tomorrow's Craftsmen

APPRENTICES ARE BEING TRAINED in 16 arsenals, according to W F Patterson, director, Bureau of Apprenticeship, U S Dept of Labor. Six arsenals make military equipment, eight provide field maintenance service and ordnance-equipment storage, Aberdeen does research and development, Redstone is on guided-missile development. Nine Air-Force bases also have apprenticeship programs for maintenance men. NACA has programs at Langley Field, Va, and Lewis Lab in Cleveland. Other government projects with apprentice programs include Oak Ridge National Lab, Savannah River Project of the AEC, Tennessee Valley, Bureau of Reclamation's hydroelectric projects like Boulder and Bonneville dams, and the Alaska Railroad maintenance shops. Of private plants on ordnance work, however, nearly a third have no permanent, well-organized apprentice systems. This is again an indication of current weakness in craftsman training. Of apprentices in training in government plants, nearly 60% are machinists and other metalworking crafts, an indication of the relative importance of our industry in today's manufacturing picture.

Tips on Carbide

WE'VE WONDERED whether the clamp-on tip—or even one held by an adhesive (*AM*—Feb 28 '55) might supplant the brazed-on tip and its attendant problems of cracking and dissimilar expansion. An expert in the field says, "There'll always be room for both," despite the current trends towards clamp-on types. The brazed tip must be used where space is a problem, and adhesives are not yet available to take either the heat or the load. The clamped bit offers economy, ready replacement with ready-ground tips—and, better still, permits carbide suppliers to make harder grades because brazing strains don't enter the picture. Actually, of course, recent technical advances make it possible to produce carbides that are *both* harder and tougher, rather than sacrificing one for the other.

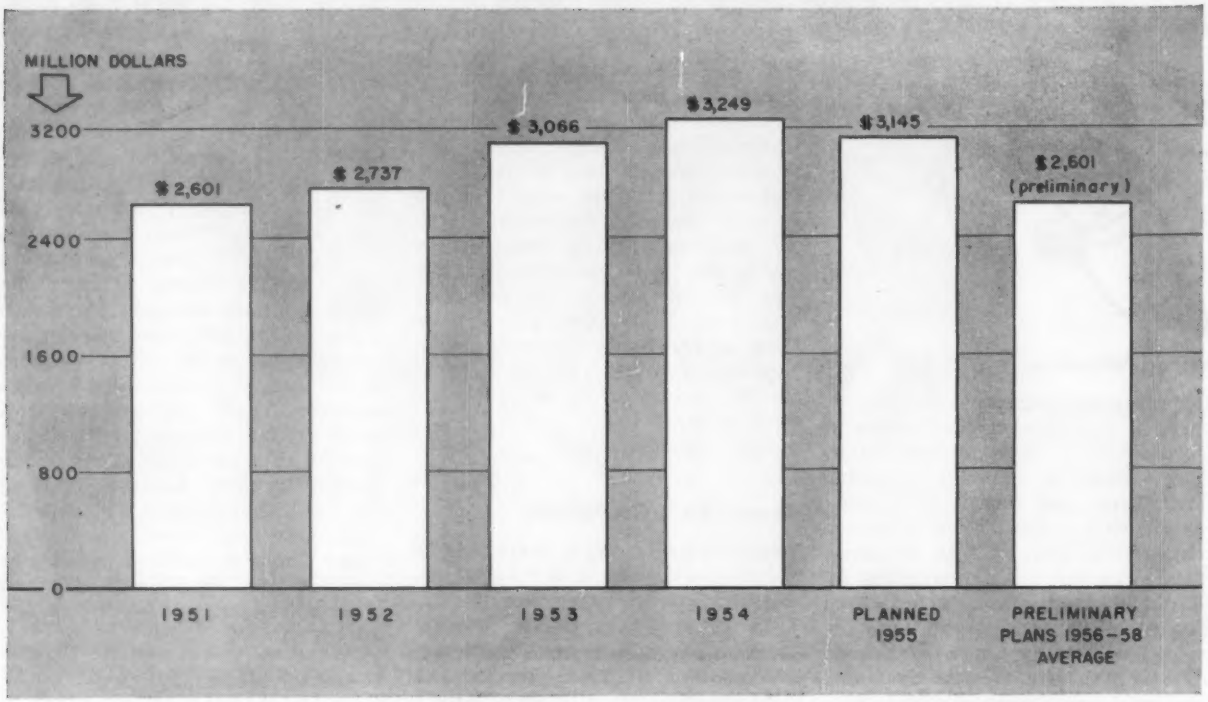
Diamond Mount

DR H TRACY HALL, GE Research Lab, recently involved with the development of man-made diamonds, has a novel method of mounting stones in diamond tools to save up to 90% of the crystal. A considerably smaller diamond than usual is mounted in a shallow cavity by "wetting" with titanium hydride, and using a solder like silver-copper. Brazing is done by induction or radiation heating in a high-vacuum system, or in an atmosphere of very pure argon or hydrogen. This provides a very secure anchor, and eliminates the "root," frequently ¾ of the diamond. Heat transfer is much better from the mechanical bond, reducing the danger of fracture from overheating.

Quickie

"IF YOU CAN KEEP YOUR head while others all around you are losing theirs—maybe you don't understand the situation."

News of Metalworking . . .



HERE ARE METALWORKING'S SPENDING PLANS, projected through 1958. While it will be noted that purchases of new plant and equipment estimated for 1956-1958 are roughly the same as those for 1951, it must be remembered auto cutbacks are largely responsible — and preliminary plans are always conservative

CAPITAL SPENDING: Peaking Now,

NEW YORK — U S business will spend more for new plant and equipment this year than at any time in history. And this rising trend in capital spending may carry well beyond this year. That's the finding of McGraw - Hill Economics Dept Eighth Survey of Business Plans for New Plans and Equipment.

U S Business as a whole plans to increase its capital spending 5% over 1954. Manufacturing spending will increase 3%. But Metalworking firms plan a 3% cutback — entirely explainable by expected reduction of 24% in auto industry spending, where major model changeovers were completed last year.

Within the Metalworking industry, plans vary widely from group to group — from a 14% increase by machinery manufacturers down to 4% by the transportation equipment industry (except autos). All Metalworking segments aside from automotive plan increases.

Judging from U S industry's present plans, capital spending will stay high at least through 1958. All-business spending for 1956, for instance, will be only 3% under the present peak. All-manufacturing will spend about 7% less. And present plans for 1957-8 indicating spending will stay at or slightly under 1956 levels.

Metalworking's intended spending is well below the all-business and all - manufacturing averages. Expected spending decline between 1955 and 1956 is 13%. Most of this drop will be in the "other transportation" (non - auto) category, which may be as much as 45%. Autos will cut only 7%, and machinery and electrical machinery will cut about 13%.

These figures are ultra-conservative. In the past, preliminary plans of industry have always been revised upwards. If this holds true, the years 1956 through 1958 will be years of high — perhaps record — buying of new plant and equipment by all business. And Metalworking, too. Make a special note of this: *business's estimate of capital spending is more optimistic than it has been in any previous McGraw-Hill survey.*

What will happen to sales and capacity in this time? Manufacturing firms anticipate a 21% sales jump by 1958. Metalworking expects to do even better. Capacity-wise, manufacturing expects to increase 5% this year, 11% more by 1958. Metalworking expects to add 7% by 1955's end, another 13% by the end of 1958.

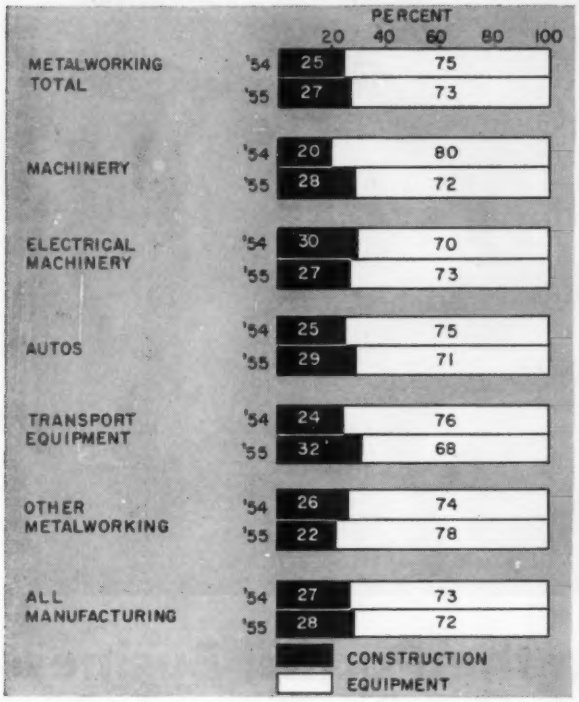
SALES EXPECTATIONS

(percent increase)

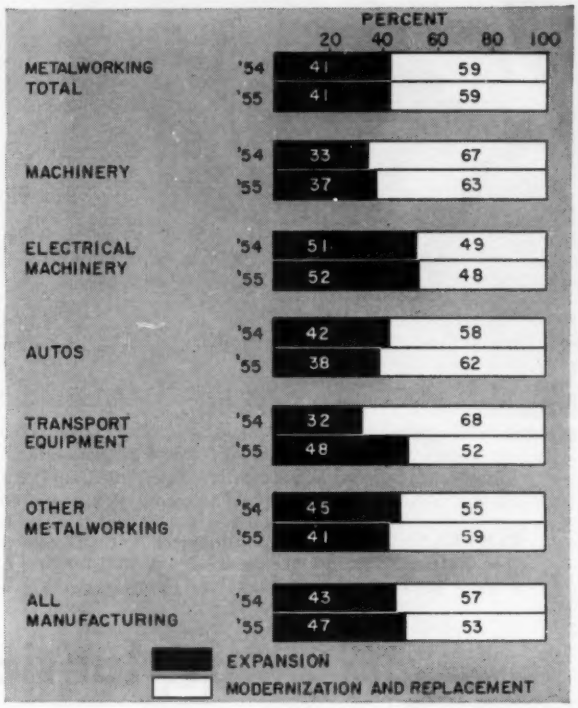
	1955-54	1958-1954
METALWORKING	7	23
Machinery	5	25
Elec. Machy	6	29
Autos	na	na
Trans. equip (incl aircraft	2	10
Other Mwkg.	7	27
Primary metals	10	18
Chem. processing	7	21
Foods, beverages	4	15
Textiles	8	23
Other manufacturing	8	23
ALL MANUFACTURING	7	21

na—not available

Field Report U.S.A.



WHERE DOES THE MONEY GO? Here's a 1954-5 comparison of relative expenditures for construction and equipment in the Metalworking industry



EXPANSION VS REPLACEMENT and modernization comparison for 1954-5 shows that the latter categories have a slight edge over new plants

It'll Stay High for at Least Three Years

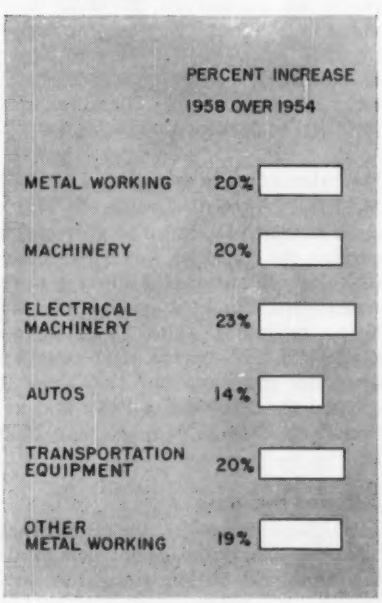
BUSINESS PLANS HIGH CAPITAL SPENDING THROUGH 1958

(millions of dollars)

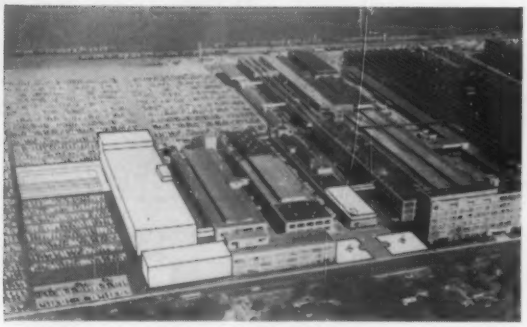
	Actual 1954	Planned 1955	Preliminary Plans 1956	1957	1958
METALWORKING	$3,249	$3,145	$2,927	$2,579	$2,497
Machinery	694	792	690	673	642
Electrical machinery	439	483	415	401	367
Automobiles	1,295	984	915	836	817
Transport equipment (including aircraft)	191	199	109	92	94
Other Metalworking	630	687	598	577	577
PRIMARY METALS	811	1,042	1,142	899	937
Chemical processing	2,827	3,017	2,829	2,825	2,775
Food and Beverages	765	712	606	672	631
Textiles	331	349	303	320	320
Other manufacturing	932	961	962	942	877
ALL MANUFACTURING	8,915	9,226	8,561	8,237	8,037
Petroleum industry	4,900	4,913	4,961	4,921	4,920
Mining	396	387	298	237	251
Railroads	854	820	812	795	754
Other transport, and communications	2,975	2,969	3,082	3,026	2,743
Electric and gas utilities	4,219	4,430	3,766	3,544	3,987
Commercial	6,379	7,336	7,556	7,629	6,969
ALL BUSINESS	27,888	29,391	28,380	27,802	27,143

Sources: U S Dept of Commerce, SEC, American Gas Assn, Electrical World

HOW CAPACITY WILL INCREASE BY 1958



☆ Field Report USA:



HIGHLAND PARK, MICH: this is how Chrysler Corp's engineering center here will look when a multi-million dollar expansion (largest in Chrysler engineering history) adds one-third to present floor space

CLEVELAND: first aluminum passenger car wheels (for Cadillac Eldorados) emerge from final forging on a giant press at Alcoa's Cleveland Works

Atlantic to the Pacific, Business

Southeast...

Labor trouble in Dixie . . .

ATLANTA — Business men and manufacturers in the South are frankly worried that the recent telephone and L & N Railroad strikes have generated enough ill feeling that the strike wave may spread to Metalworking and other industries—particularly if the auto companies and the United Auto Workers fail to reach an agreement in talks now going on. In fact, at press time Birmingham labor leaders were thinking of calling a general strike in that city in support of Birmingham's striking telephone workers.

Hercules sprouts wings . . .

MARIETTA, GA—Lockheed Marietta's made-in-Dixie turbo-prop cargo carrier, the Hercules, made a spectacular flight debut near Atlanta in mid-April—four months ahead of Air Force estimates. The giant, 54-ton plane left the ground after only an 8-second run, and by the time it crossed the 10,000-ft runway had attained an altitude of more than 2500 ft.

Defense business . . .

Business firms in the Southeast have received defense contracts totaling about $8 billion since the outbreak of Korea. Though this money has stimulated an influx of new business and expanded existing ones to some degree, it's merely a scratch on the $112 billion that the government let in contracts throughout the nation during the 4½-year period.

New businesses mushroom . . .

North Carolina reports more new businesses chartered in the first three months of this year than in any first quarter in Tarheel history, with small manufacturing bulking well up into the high percentages. This trend generally held true for the rest of the Southeast as well. Both Alabama and Florida reported upswings. And Alabama also reports reopenings of steel plants in Birmingham that were shut down during last year's slackoff.

Briefly noted . . .

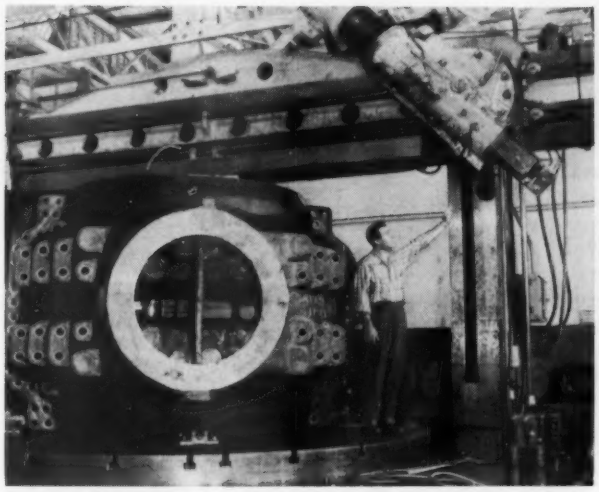
W A Stevens Co, tool and die makers, will build an 18,000-sq-ft plant in Vidalia, Ga. . . . Kraft Equipment Co is building a new pulp-and-paper-making machinery plant. . . . Winder Aircraft Corp, aircraft component makers, will locate a new 25,000-sq-ft plant at Winder, Ga. . . . Kershaw Mfg Co, Montgomery, Ala, has started a $50,000 expansion program. Firm makes railway track maintenance equipment. . . . Alabama Ordnance plant at Childersburg will get a $37-million going-over.

New England...

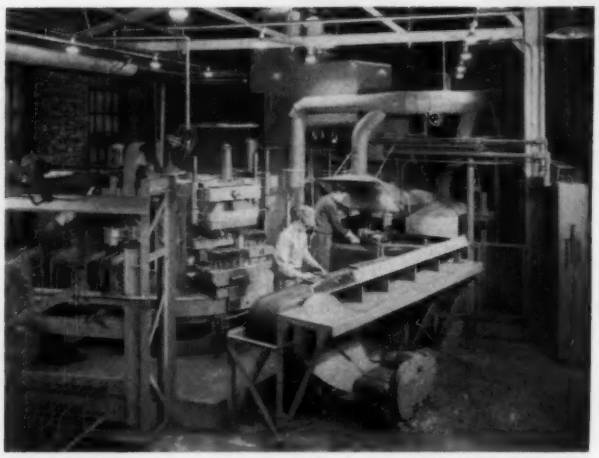
The road back . . .

BOSTON—At last, Metalworking employment, and employment generally, in the New England area is on the upgrade—after hitting some pretty low spots in the last year or so. True, the employment rise is small—900 more employed in December than in November, 1200 more in January than in December, for example—but it's a direct reversal of recent trends. Even non-electrical manufacturing, hardest hit, shows an uptrend. Stamping business in the New England area is good—with some major concerns reporting 60-90 day backlogs. But this isn't true of tool and die business, which is off almost 50% from last year in New England, and has been dropping steadily in the last month or so. Inventories generally—tool and die, stampings, etc — are down just a little.

Area-by-area, New England Metalworking shows peaks and valleys. While some Metalworking centers are showing only a slight improvement, Worcester, Mass, is an example of one town that's going great guns. Hard hit last year, Worcester was generally on a 30-hr workweek or worse. Today, area plants are op-



SUNNYVALE, CALIF: Westinghouse machinist Albert Marchese's suggestion to raise the rail of this boring mill to accommodate castings formerly machinable only on a horizontal boring mill allows the firm to machine pressure cylinders for generators in one-third of previous time, won him a $1396 award



CHICAGO: believed to be the first integral shell molding and pouring system offered commercially, this unit developed by Link-Belt Co can produce up to 240 molds an hour with two-man operation. Installations are tailored to the individual foundry. All operations are pushbutton controlled

Is "Good"—as Output Hits All-Time High

erating on workweeks of anywhere from 45 to 58 hours. All in all, New England industry looks better than it has in a long, long time, and at least half of the business lost during the recent recession has been regained.

Demand for durable goods in the non-electrical machinery and fabricated metals fields is up tremendously over a year ago. Fabricated metal output rose 31.8 points on the Associated Industries of Massachusetts Index of Orders (1947-100) since last year, and non-electrical machinery did almost as well, with a 24.7-point jump. Electrical machinery was up 4.6 points on the Index, while primary metals orders are 8 points ahead of what they were last year.

Detroit...

Lincoln-Mercury Split?

Speculation is that the long-rumored split-up of the Lincoln-Mercury Division of Ford will take place soon. Mercury sales have zoomed, while Lincoln sales, hampered by lack of style change, have dawdled. Result is that some observers think Lincoln will become part of Ford's new Continental Division, which is now readying a $10,000 Rolls-Royce-like luxury car for September introduction. Mercury would continue as a separate division. Ford is said to be readying another passenger car line, tentatively designated inside the company as the "Model E." The new nameplate, if it's actually on the way, wouldn't show up for at least two years.

Square D to negotiate . . .

Square D Co and the independent United Electrical Workers, antaganists in last year's 107-day strike, marked by violence on UE's part and charges of communism on Square D's, started wage negotiations April 19, but is expected to delay settlement until UAW and the auto companies settle. Any wage pattern set there would probably be echoed by Square D and UE. Company's 1200 workers are little-inclined to repeat last year's strike.

Detroit notes . . .

Local tool and diemakers, experiencing a let-down from last year's broad styling changes, think they've now reached the year's low point and from now on will begin to realize greater volume. Activity to date has been held down because few major auto changes are contemplated for 1956, but by June tooling orders should start coming through for 1957 models. . . . Chrysler has declined to buy or lease Hudson's old Detroit body plant, abandoned when Hudson moved to Wisconsin, following its merger with Nash. . . . Michigan's only aircraft producer, Meyers Aircraft Co, is expected to get into production of a four-place, single-engine personal plane soon. . . . Michigan factory employment in February was significantly ahead of February 1954—by 39,000 workers—26,000 of them in the auto industry. . . . Michigan State College will sponsor a 3-day symposium on "Automation—Engineering for Tomorrow" at East Lansing May 12-14, covering the subject from the technical and sociological points of view.

Southwest...

Situation: "irregular" . . .

HOUSTON—Irregularity in backlogs just about describes screw machine product business in this area. Some shops have several weeks' work ahead, others aren't so fortunate. General Products Co, Houston, reports "business is good," but another finds business today is much more competitive and not as good as it was a year ago. This firm admits receiving a lot of orders—but they're smaller than they were a year ago.

Although deliveries of foreign bolts to the Houston area have slowed down considerably in recent weeks (reason: they're difficult to buy now in Germany and other foreign countries), nuts, fasteners and flanges for

Field Report USA:

oil field equipment are flooding the area. And the influx of imported wood screws has local manufacturers worried.

Job orders are getting tougher . . . Jobbing machine shops in the Houston area are finding orders harder to get these days, and they're cutting back their workforces some. Reason for this is that there are a lot of new shops in the area—all competing for the same or slightly larger number of orders. Another reason: now that defense orders are phasing out at the bigger shops, they're farming out less and less machine work.

Sundstrand's new Denver plant . . . DENVER—Construction has started near here on Sundstrand Machine Tool Co's new $5-million plant to produce constant-speed drive mechanisms for military jet aircraft. Plant is scheduled to begin output early in November, will have a workforce of 400.

Chicago...

Chicago business outlook . . . It's hard to get auto parts makers to talk these days—thev're all busy, most of them running at peak output. But none of them wants to do any crystal-ball gazing as to business conditions for the rest of the year. Reason: they won't know which way the business wind blows until the results of UAW's battle with the automakers over GAW are in . . . One major midwest auto instrument maker reports he's "loaded to the gills" with orders, is working plenty of overtime and plans to add substantially to his workforce. But he, too, won't estimate business conditions more than a month ahead—even if there's no auto strike . . . Chicago area competition for tool and die business is keen. Most shops have enough business for hand-to-mouth operation. Few, if any, are loaded to capacity. A lot of shop owners think high Chicago area production costs are driving some tool and die business out of town . . . Steelmaking operations in the Chicago area continue to soar in all lines, with even long-slowed-down railroad rail output picking up . . . Steel warehouse inventories are in good shape, and warehouse sales of steel products are moving steadily upward.

Employment ups and downs . . . CHICAGO—The employment situation in the Illinois area is peculiar, to say the least. While the overall employment picture in manufacturing has been pretty level since last fall, some Metalworking industries have registered decided increases, while others have dropped off. Non-electrical machinery, for example, benefited from the recent comeback in farm equipment sales, led all state industries with a 9200 employee rise in January and February. On the other hand, electrical machinery manufacturing workforce dropped 5700, so did the miscellaneous product manufacturing workforce, to the tune of 1500 workers. State-wide manufacturing is down considerably from year-ago levels, but it's expected to rise.

Chicago area briefs . . . Caterpillar Tractor Co, Peoria, Ill, reports a sales increase of 35.52% over its February 1954 sales of $29.8 million . . . A O Smith Corp, Kankakee, Ill (domestic water heaters), Motorola Inc, Chicago (auto and portable radios), and Nash-Kelvinator's Norge Division (washers, dryers, refrigerators) all report record-breaking output . . . Chicago area steel mills chalked up the biggest month in their history in March, with output of 1,866,300 tons. They claim to have topped first quarter Pittsburgh output by 794,400 tons.

East Coast...

Emptying the field . . . That's been Republic Aviation's No. 1 job for some time. Back last September, Republic ran into trouble when engines for its F-84F Thunderstreak failed to arrive on schedule, and the company was forced to store finished planes, sans engines, in a field adjacent to its Farmingdale, L I, plant. As time went on, the engines still failed to materialize, and planes piled up on the field until Republic had to cut production and lay off workers. Republic is now happy to report the missing engines have arrived, they're being installed in the planes, and the field is fast being cleared.

While Republic hasn't done much rehiring of its laid-off workers, it expects to do so soon when contracts come through for the XF103 and the F-105—highest numbered jet fighter, said to be the successor to the F-84F. As things stand, Republic today has a $1 billion backlog, employs 21,000 workers.

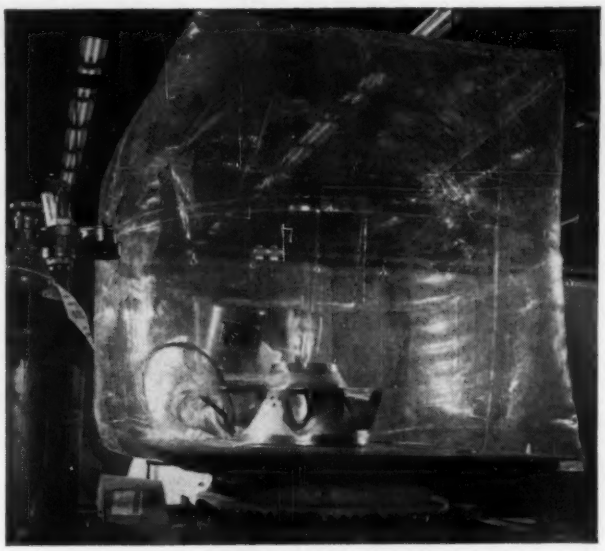
East Coast briefs . . . The Wilmington, Del, Buick-Oldsmobile-Pontiac assembly plant will shortly add a second shift employing some 800-1000 workers in addition to its present workforce of 2500. . . . Industrial output in the Pittsburgh area continues to rise. As of March 26, production registered 204.2 on the University of Pittsburgh Index (1935-1939 = 100), compared with 161.8 just a year ago. . . . Pittsburgh Forgings Co reports a decided pickup in all its lines so far this year, expects to do even better for the balance of 1955. . . . Pratt & Whitney Aircraft is presenting the first J-57 aircraft jet turbine, started in 1948 and completed in 1949, to the Smithsonian Institute. . . . Bullard Co, Bridgeport, Conn, has purchased 22 GE electronic tracer controls at a cost of $200,000 for use on machine tools. . . . John Diebold & Associates Inc, New York automation consultants, have moved to new offices at 430 Park Ave, New York 22. . . . Bridgeport Brass Co has successfully produced aluminum die forgings 18 ft long x 4 ft wide on a 16,500-ton press at its Adrian, Mich, plant. . . . Plant Layout Technical Workshop, Oakmont, Pa, is holding a five-day forum and workshop on three-dimensional plant layout in Pittsburgh, June 13-17. . . . Biggest U S forging operation, the $40-million combination of a 35,000-ton and a 50,000-ton press will start forging airframe parts for the Air Force at Aluminum Co of America's Pittsburgh plant May 5.

Cleveland...

Cleveland mulls over GAW . . . Following the UAW convention here, Cleveland metalworking executives did a lot of crystal-ball gazing, came up with these guesses: (1) UAW will strike the automakers if they offer serious resistance to the guaranteed annual wage, (2) the bellwether of the automakers (presumably Ford) will agree to a package increase, leaving it up to UAW how the money will be paid. Metalworking officials are divided down the middle

Field Report USA:

EDMORE, MICH: it takes only 16 ft of straight-line, automated space to handle materials, inspect and magnetic-test speaker magnets at GE Carboloy's permanent magnet plant. Setup performs operations previously requiring a 50-sq-ft area. has two electronically controlled machines, whose two operators actuate belt conveyors, control drop chutes, hoppers, magazine feeders, aligning pushing, miniature gravity conveyors and inspection and testing devices. Output is triple that of old setup



DES MOINES: Solar Aircraft Co has developed a technique for fusion welding of titanium in an inert-gas atmosphere. Gas-tight tent is fastened to welding table. Operator wears long-sleeved rubber gloves sealed to the tent to maintain perfectly controlled inert-gas atmosphere within the tent

on this: if GAW becomes a reality, should a company-union committee administer it, or should the fund be administered by a government or state agency? Other GAW speculation: GM will really go to the mat on this one. Ford's the firm most likely to cave in when the going gets rough.

Auto parts output peak . . .

Currently most Cleveland area auto parts makers are operating at peak production: Thompson Products is at a new high in valve output . . . Alcoa's Forging Division is in the same status on pistons . . . Eaton Mfg Co is hitting top output of heaters, stampings, and auto springs . . . Only sour note is that of Cleveland Graphite Bronze, whose volume has not yet caught up with the auto-building pace.

Odd employment picture . . .

CLEVELAND—This area is in the rather odd situation of seeing both employment and unemployment rise. Since the first of the year, industrial employment has gone up about 7000. During the same period, relief cases increased 4732, with 80% listing unemployment as the reason for their plight. Reasons range all the way from the unskilled complaining they're being replaced by machines, to reluctance of firms to take back laid-off workers past the 45-year mark. And many Metalworking companies are slow to add extra shifts, even though they have enough orders on the books to justify it.

West Coast...

"Generally ... in a good mood" ...

LOS ANGELES — Metalworkers in this area are generally in a good mood, but not all of them. Take the tool and die industry. It's "not exactly rosy," as one firm spokesman put it. And aireraft subcontracting is spotty, has been so for some time. But overall, the picture is bright.

Electronics industry booms . . .

Electronics continues to be a booming field—although more competitive —with the result that companies that have mushroomed in recent years are being bought up by large eastern concerns. Electronics dollar billing for the Los Angeles area reached an estimated $842 million last year, is expected to top $1 billion this year.

This means more work for job shops, too. But here again, there's more competition. Says one official of a 100-man shop that makes stampings and a variety of machined electronics parts, "Our volume is up this year. We've increased our workforce, and are working around the clock. But our profit doesn't show anything like a proportional increase. The electronics industry here grew fast, and there weren't many shops ready to service it. That meant a lot of expensive rush jobs for outfits like ourselves who were early in the field. Now there are a lot of shops in the field, and prices have become more and more competitive."

So far, the area is weak on electronics component manufacturers. Local industry hasn't been able to support high-volume output, and freight costs make it impossible to compete in eastern markets. But as end-product manufacture grows in the west, the components outlook brightens.

Job shop competition . . .

Two sources of competition for job shops in the electronics field are firms whose aircraft subcontracts have dried up, and tool and die shops. The latter industry is a little better off than in the last few months of 1954, but not much. One well-informed estimate is that business averages 30% under a year ago. Backlogs are very spotty — some shops have none, some have 3-4 weeks, some even more. Local complaint: aircraft primes are only giving out work when their own shops are temporarily overloaded. And when the orders do come, they "need them yesterday." It makes for ragged

☆ Field Report USA:

peaks and valleys in shop production schedules.

Boeing raised false hopes . . .

Tool and die manufacturers perked up when Boeing indicated it would open a new Los Angeles office and place plenty of business in the area. But now it's understood Boeing's plans have changed and work for which tooling would be required is largely going to be subcontracted. Only if it goes to Los Angeles area subcontractors will local tool and die shops get much Boeing business. Local tool and die people aren't very optimistic about the rest of the year. They think the aircraft picture will stay in its present unsatisfactory (from the tool and die manufacturers' viewpoint) state, and that other Coast industries, while chalking up high output, won't be bringing out much in the way of new products. Most tool and die shops are diversifying into new fields as a result —mostly into aircraft subcontracting.

Auto assembly stays high . . .

Los Angeles area auto assembly plants are holding to high production levels. Both Ford plants are on a six-day week. Chrysler is shifting its production lines to increase Plymouth Suburban output from 10 to 80 a day. Total output of the plant is already double that of a year ago. One automotive assembly plant supplier says "we couldn't be happier," adds that incoming orders indicate a second quarter as good as the first—barring a Detroit blowup over GAW.

Appliances look good . . .

Appliance makers are optimistic, too. One example—Interstate Engineering Corp reports March was its best sales month in a year-and-a-half, with biggest increase in vacuum cleaners.

Up in the air . . .

SEATTLE—The administration's recent decision to concentrate military striking power in the air, rather than on the ground, is making itself felt here. Firms like Boeing can look forward to several years of high-level operations. On the other hand, outfits like Pacific Car & Foundry Co, which turns out rolling stock for the Army will have to cut its workforce in the next three or four months, unless new contracts come in before that time.

"Serious economic squeeze" . . .

SAN DIEGO — Cutback in production-line aircraft building in favor of more research and development is putting an estimated 50 small Metalworking plants here in a serious economic squeeze. These plants exist largely on subcontracts from Convair, Solar, Ryan and Rohr. Current small-volume orders aren't enough to keep the smaller plants going—and now there's talk of mergers.

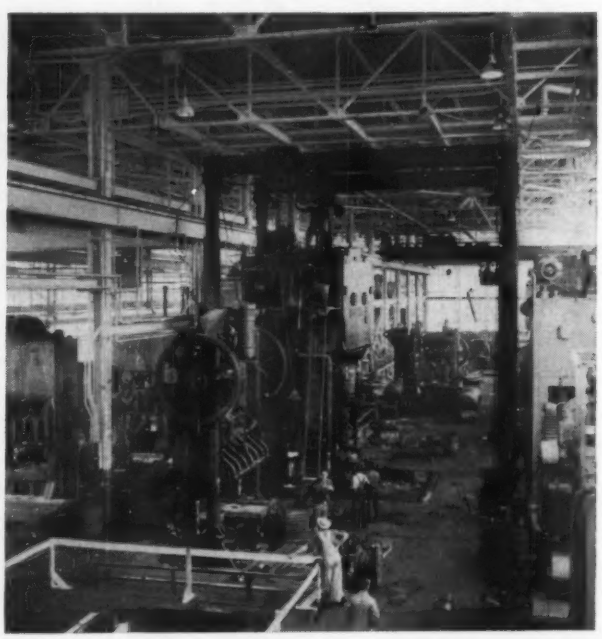
Says a local survey, "A current famine in work has resulted in a profitless scramble for small work." Major firms are concerned over this, because when production orders do come in, it means they can be handled only if the small plants are on hand to turn out detailed parts. One example: Convair subcontracting amounted to $31 million in 1953, in 1954 it fell off to $20 million—and it's still dropping. Both Ryan and Rohr are largely assembly outfits and much of their parts is shipped in by out-of-town subs, because San Diego subs are too small to make really complex components. No matter how you look at it, it's a tough squeeze play—with the small metalworking plant caught in the middle.

Portland strike threat ends . . .

PORTLAND, ORE—Pay increases of 5¢ an hour for a journeyman scale of $2.25 and another 5¢ next year put an end to a recent strike threat by some 8000 metalworkers in the Portland area recently. The new two-year agreement also provides this new clause: in the event of a national emergency, "inequities" that arise will be readjusted. In return, labor will try to stop employers from pirating. Involved in the settlement were 70 plants of the United Metal Trades Association and the AFL Portland Metal Trades Council, comprising in all seven unions and molders and other foundry workers. Pay boosts will go to machinists, boilermakers and blacksmiths, electricians, laborers, painters, teamsters and warehousemen, plus foundry workers. Larger plants involved in the settlement include: American Pipe & Construction, Northwest Marine Iron Works, and Monarch Forge.

Ford moves in . . .

LOUISVILLE: it took some 2000 people to move operations from one plant here to a new assembly plant five times bigger. The new plant started output of 880 cars and trucks a day April 18. More than 150 truckloads of tools, materials and equipment were involved in the plant-to-plant move



. . . and Chrysler expands again

DETROIT: Chrysler is spending several million dollars expanding and modernizing its Plymouth output. Here, a huge stamping press is relocated and reinforced at the Mack Ave, Detroit, plant to beef up Plymouth body output

WOODWARD'S STUDENT WORKFORCE: It's Paying Dividends —Tangible and Intangible

Top-notch engineers and governors (the hydraulic kind) are the products of an Illinois firm's experiment with an all-student workforce at its plant in a Colorado college town

FORT COLLINS, COLO — Entire workforce of Woodward Governor Co's new branch plant here is made up of engineering students from Colorado A & M College, who put in one to four eight-hour workdays a week over and above their engineering school curricula. In all, some 60 students have their work shifts integrated into the plant's 48-hour workweek — operating 30 machines in the manufacture of hydraulic governors.

To Colorado A & M, the Woodward plan means 60 good-paying jobs for deserving students. To Woodward, which has its main plant at Rockford, Ill, the Fort Collins setup means that the company has an auxiliary manufacturing unit in an area well away from the concentrated industrial east and midwest in the event of a national emergency — a plant staffed by eager, highly intelligent workers, who are getting invaluable "earn as you learn" experience. Fort Collins and Colorado A & M were selected as the best possible site for the student-operated plant after months of research.

The labor force includes students from all four college years — all carefully selected. Incoming students become replacements for those who graduate or move on each year. As academic schedules change each quarter, workloads are readjusted, and it is expected enough students will stay through vacation periods to keep the plant going on a six-day-week basis. Workday begins at 1:00 pm, ends at 9:30 pm, leaving mornings free for classes.

Only Four Non-Students on Staff

Three supervisors and a maintenance man from the Rockford plant are the only non-student employees, overseeing the first three operations in the manufacture of governors. The remaining operations are performed at Rockford. To perform these operations, involving use of 30 machines of 10 different types doing preliminary work on some 100 different parts, each student first undergoes a course in machine operation, given by instructors from the Rockford plant. The student operators must perform machining operations accurate to within 3/1000ths of an inch.

Additional machines are being put into operation at Fort Collins and ultimately the plant hopes to be able to manufacture one complete type of governor.

Effect Is Far-Reaching

Although Woodward's actual engineering department is relatively small and can absorb only a few Colorado A & M student engineers after graduation, Woodward's long-range effect on engineering is considerable, turning out, as Colorado A & M's Dean Evans puts it, students with "fine industrial experience as members of a producing team," — better equipped to succeed in a vital profession because of a first-hand working knowledge of industrial production.

MIT to Hold Numerical Control Seminar This Summer

CAMBRIDGE, MASS — Numerical control of machine tools will be the subject of a two-week special summer program to be held here by the Massachusetts Institute of Technology Aug 2-Sept 2. Registration preference will be given to applicants engaged in design of machine tools, or planning to enter that field.

Lecture topics wil include: basic information principles, processing with machine tools, machine tool applications of numerical control systems, equipment design for numerical control systems, design considerations for system reliability, and management, operation and maintenance of numerically controlled machine tools. The group will actually machine a workpiece as a final problem.

How Do You Sell More Capital Goods?

CHICAGO — A new study dealing with market research in the capital goods field has just been issued here by the Machinery & Allied Products Institute's Council for Technological advancement.

The study, published in booklet form and based on the marketing research experience of capital goods producers, is designed as a practical guide to other firms interested in developing their own research programs. It covers:

- Evaluation of general business conditions as they influence sales volume and profits.
- How to appraise the relative position of a firm in its industry, and how to tell whether it is gaining or losing competition-wise.
- How to determine the needs of present and prospective capital goods customers in order to create or modify a product to meet market requirements.
- How to analyze the effectiveness of marketing methods in meeting and increasing product demand.
- A general guide to performing product research for existing products, and development and introduction of new products.

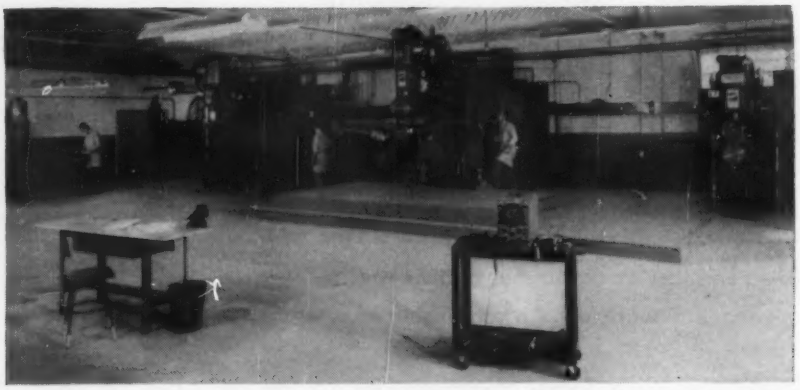
Sections of the booklet deal with economic forecasts, sales forecasts, effectiveness of marketing expenditures, new product development, and market potentials. Another section shows the basic distinction between capital goods and consumer durables.

Copies of "Marketing Research — a Guide for Capital Goods" are available at $3 per copy from Council for Technological Advancement, 120 S La Salle St, Chicago 3.

Got an Idea for a New Weapon?: Tell ARDC

BALTIMORE—If you have an idea for a new guided missile, or a new principle of aircraft design, or a high-temperature metal—tell the Air Research and Development Command. ARDC is intensifying its search for innovations that could lead to dramatic strides in Air Force development.

If you have such an idea submit your proposal to Lt Col M W Beardsley, Analysis & Evaluation Office, Air Research & Development Command, Box 1395, Baltimore 3, Md. Include a description and an estimate of expected performance.



SCIAKY LAUNCHES WELDING RESEARCH LABORATORY. At an open house March 30, Sciaky Bros Inc's Western Research Division, Los Angeles, showed such equipment as the world's largest spot welder (left), in an impressive lineup of complex welding machines (right). Sciaky does customer investigations as well as basic welding research.

Companies in the News . . .

Richard Bros Division of Allied Products Corp has completed a new stamping plant at Eaton Rapids, Mich, capable of handling dies up to 15-ft long, and pressure capacities to 900 tons. Plant will specialize in short-run stampings.

Aeroquip Corp has acquired **Maxman Products Inc,** Los Angeles makers of pipe joints, clamps and valves.

Westinghouse has completed the first step in an $8.7-million plan to modernize its Springfield, Mass, motored appliance plant.

Michigan Molded Plastics Inc, Dexter, Mich, has been purchased by **St Regis Paper Co,** will continue to make plastic parts for the automotive and appliance industries.

Hammill Mfg Co, Toledo sheet-metal die and special machinery manufacturing firm, has been formed by Ed Hammill, ex-general manager of Henzler Mfg Co, Toledo.

Pullman-Standard Mfg Co and **ACF Industries** are sharing a $5.7-million order from **Chesapeake & Ohio RR** for 500 box cars.

Douglas Aircraft has a $30-million order from **KLM Royal Dutch Airlines** for 10 of Douglas new "Seven Seas" DC-7C transports.

WKM Mfg Co, Houston pipeline and production valve-making subsidiary of **American Machine & Foundry Co,** plans a $7-million, 10-acre plant.

Burton Mfg Co, Santa Monica, Calif, has broken ground for a 37,000-sq-ft servo-motor plant there.

Forney Industries Inc, Fort Collins, Colo, has purchased manufacturing rights to the Aercoupe Model G club aircraft from **Sanders Aviation Inc** and **Miller Propeller Mfg Co,** will move tools, dies and equipment to Fort Collins.

Ford's Continental Division has completed a move into its new plant and offices in Ecorse Township, Mich, from temporary quarters in the old Henry Ford Trade School in Dearborn. Building covers 300,000-sq-ft, now employs 330, will ultimately employ 600.

Brown Instrument Division of Minneapolis-Honeywell has purchased a six-story plant formerly occupied by Apex Hosiery Co in Philadelphia for $1.5 million, will consolidate its Philadelphia facilities there.

Raytheon Mfg Co has started construction of a 203,874-sq-ft plant at Melrose Park, Ill, to be the nucleus of an eventual expansion that will include all of Raytheon's television manufacturing facilities, plus warehousing.

Ryan Industries Inc, Detroit maker of aerial cameras and automotive parts, has been purchased by **Textron American Inc,** offshoot of a textile merger between American Woolen and Robbins Mills.

Wyman-Gordon Co has opened an office in Los Angeles to serve West Coast air frame makers using forgings from its 35,000-ton Air Force heavy press at North Grafton, Mass.

Fox Hills Tool & Die, Culver City, Calif, has changed its name to **Product Packaging Engineering.**

Westinghouse has dissolved its subsidiary, **Schneider Mfg Corp,** Muncie, Ind, is reorganizing it as its **Hydraulic Drives Dept, Gearing Division,** manufacturing hydraulic torque converters, brakes and transmissions.

Sunshine Scientific Instrument Co, Philadelphia, has purchased outright all stock, parts, drawings, tools, jigs and fixtures and patent rights to 18 instruments developed by **GE's Special Products Division,** will now make and service them.

National-U S Radiator Corp is the new name of the recent U S Radiator-National Radiator combine.

Westinghouse's Sunnyvale, Calif, plant has a $1.3-million Air Force order for wind tunnel equipment.

North American Aviation is building a $1.5 rocket-engine calibration and test building in California's Santa Susana mountains.

Thomas P Skelly Bolt Co of Philadelphia is celebrating its 100th year.

Convair has received a $15-million Air Force contract to make F-102A supersonic interceptors and parts.

Larry Darnell, formerly sales manager of Metro Tool & Gage, Chicago, has been named to head sales of US Broach Co, Detroit

Jack Welch has been named general manager of Sheffield Corp's newly-formed Machine Tool Division (Murchey and Cavitron). For additional appointments, see below

Edwin R Smith, vice president of Seneca Falls (NY) Machine Co, maker of Lo-swing lathes and automation equipment, has been elected executive vice president and general manager

Names in the News . . .

Edwin R Broden, formerly executive vice president of the Carborundum Co, Niagara Falls, NY, has been elected to a similar post at SKF Industries, Inc, Philadelphia, Pa.

C J Rowles, vice president, sales, of Euclid Electric & Manufacturing Co, Madison, Ohio, has been elected executive vice president and a director of the company.

Paul R Hatch, formerly vice president, sales, of Brown & Sharpe Manufacturing Co, Providence, RI, has been elected executive vice president of Weldon Tool Co, Cleveland. Other officers elected: **Carl A Bergstrom,** board chairman; and **Walter C Bergstrom,** president.

Elmer H Wegner, general manager of manufacturing, has been promoted to vice president, manufacturing, of the Cleaver-Brooks Co, Milwaukee, Wis.

Owatonna Tool Co, Owatonna, Minn, assignments: **President R A Kaplan** to board chairman; **A R Kaplan,** vice president of sales, to head the company; **R W Kaplan,** formerly general manager of Truth Tool Co of Mankato, Minn, to OTC executive vice president; **R E Schuster,** OTC time study and methods engineer, to succeed Mr Kaplan at Truth Tool; **D J Kaplan,** production manager, to engineering vice president; and **Robert Allyn,** assistant sales manager to sales manager.

Sheffield Corp has named general managers of recently-formed production departments: **Victor Boll,** Contract Services; **William I Wilt,** Standard Production Instruments; **W Fay Aller,** Research; **Benton D Witemeyer,** Fixed Gages & Inspection Room Instruments.

Lynn G White, coordinator of sales and engineering for the Toolset Division of General Riveters, Inc, Buffalo, NY, has been appointed sales manager.

A M Thomas, Chicago district manager of Heller Brothers Co, has been appointed director of sales of the Newcomerstown, Ohio, file manufacturer.

Arthur G Tichenor, serving in a consulting capacity on the staff of headquarters manufacturing, Westinghouse Electric Corp, Pittsburgh, has been named manager of manufacturing, industrial products division.

Fred E Harrell, general manager of Marquette Metal Products Co, Cleveland, has been named president of the company. He succeeds **Herbert Gleitz,** founder of the firm, who retired April 1.

Theodore W Chase, formerly purchasing agent for Pennsylvania Water & Power Co, has been appointed manager of the Coupling Department, Metal Products Division of Koppers Co, Pittsburgh, Pa.

Russell M Wheeler has been named chief engineer of the Seneca Falls (NY) Machine Co, and **Joseph Sawitzke,** formerly superintendent of Hendey Machine Co, Torrington, Conn, has been made manufacturing engineer.

Chevrolet moves: **R L Dustman,** Detroit plant manager, to manager of productive equipment; **Sidney H Smith,** manager of the Flint, Mich, plant, to take over Mr Dustman's post; **H L Whitmer,** master mechanic, to operations manager of the pressed metals division; and **C C Brewer,** general production superintendent of the transmission division, to operations manager there.

William D Gilder, formerly chief metallurgist at the Weatherhead Co, Cleveland, Ohio, has joined the Reed Roller Bit Co, Houston, Texas, in a similar capacity.

Sheller L Steinwender, formerly vice president of the Scaife Co, Pittsburgh, has been appointed vice president of the Permutit Co, New York.

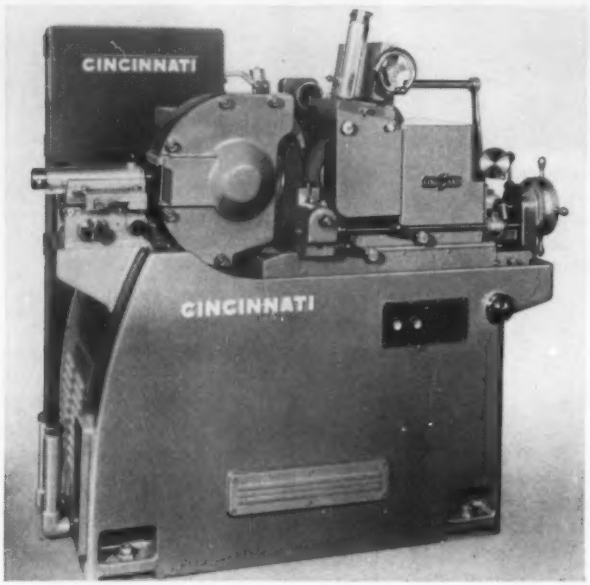
Paul E Beattie, associated with O & M Machine Co, Los Angeles, has been appointed vice president and general manager.

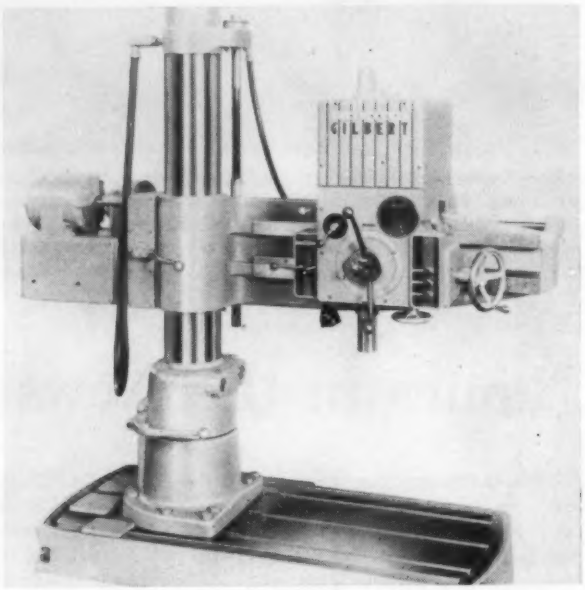
OBITUARIES

William A Roberts, 57, president of Allis-Chalmers Manufacturing Co, and chairman of the executive committee, died April 12 in Milwaukee.

Frank A Hiter, 63, senior vice president and a director of Stewart Warner Corp, Chicago, died April 9.

New Shop Equipment,





Cincinnati Centerless Grinder Offered In Small-Size Model

The No. 0 Cincinnati centerless grinder was designed to handle metallic and non-metallic parts ranging to ½ in. in diameter. The wheel spindle is mounted in a Filmatic bearing—a multiple-segment bearing which supports the spindle on high-pressure wedge-shaped films of oil. Bearings are self-adjusting—spindle lubrication is automatic and positive.

The regulating wheel unit is carried on the base in two wide dovetail slides. A swivel plate is located between lower slide and base to permit correction of slight errors in straightness.

Regulating-wheel speeds are infinitely variable from 22 to 300 rpm and indicated on a tachometer. Adjustments of wheel are made by pilot-type handwheel equipped with micrometer dial—hand infeed lever is conveniently placed.

The wheel-truing attachment is hydraulically actuated and trues the wheel to a straight cylindrical shape and to slight tapers if desired. A profile hydraulic truing attachment is available at extra cost. All truing attachments are of the diamond type.

Workrests can be supplied for infeed or through-feed grinding. A Roto-Feed automatic infeed attachment can be supplied as an extra.

Grinding wheels are 16-in. max dia with 10-in.-dia hole and max width of 4 in. Regulating wheels are 9-in. max dia with 4-in.-dia hole with max width of 4 in. They are mounted directly on end of regulating wheel spindle.

A separate cutting-fluid tank of 40-gal. capacity and individually motor-driven cutting-fluid pump of 21-gpm capacity are located at rear of machine. Electric motors are completely enclosed; controls are located in dust-tight panel with built-in disconnect switch.

Cincinnati Grinders Inc, Cincinnati 9, Ohio

Air Vise

Speedy Air Vise, Model 60, has jaw gripping force of 15 times airline pressure. At maximum operating pressure of 150 psi, from either an airline or individual compressor, it develops a max jaw pressure of 2225 lb. Soft steel jaws are easily fitted with cavities to hold castings, etc, or cavities can be milled into the iron jaws for holding special shapes.

W R Brown Corp, 2701 N Normandy Ave, Chicago, Ill

Radial Drilling Machine Has High Spindle-Speed Ratio

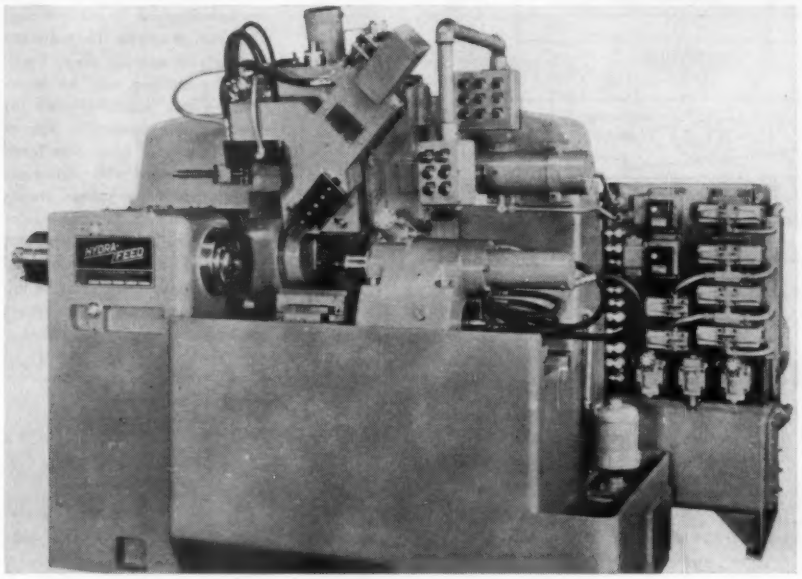
Highest spindle-speed ratio in its class is claimed for the new 3-hp radial drilling machine announced by Gilbert. Three spindle speed ranges are 40-1600, 50-2000, and 80-3200 rpm. Twelve geared speed changes are provided in the head by means of sliding heat-treated and hardened alloy steel gears mounted on ground integral multiple-splined shafts.

Machine is equipped with automatic reverse to spindle. Spindle and spindle sleeve are counterbalanced by adjustable spring mechanism. Spindle nose has Morse taper hole fitted with renewable hardened tang slot. The head is mounted on the arm on two dovetail slides which require no adjustable gibs because weight of head is carried on adjustable ball-bearing rollers which operate on hardened-and-ground way.

The standard feed mechanism has four feeds: 0.003,, 0.007, 0.011, and 0.015 ipr. Machine is built with 3- or 4-ft arms and 9-in. column. Safety features include automatic stopping of arm movement. Variety of bases are available.

The Cincinnati Gilbert Machine Tool Co, Cincinnati 23, Ohio

Materials and Parts . . .



New Hydra-Feed Tracer Lathe Is Versatile and Rugged

Hydra-Feed has announced the introduction of a new tracer lathe which is reported to feature ruggedness, versatility, and high production. The HD-8 lathe has the tracer slide located on the top carriage to lessen possibility of chips getting into the slide. Front of the machine is unobstructed for ease of loading, unloading, and checking work.

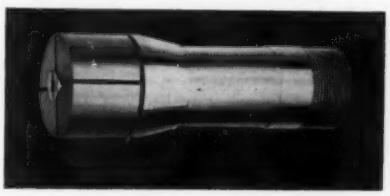
Machines can be supplied with constant or variable speed drive for the spindle. Also available is an auxiliary rear carriage for facing, grooving, chamfering, or other cuts handled by straight plunge operation.

Either flat or round templets can be used with the HD-8 tracer lathe, positioned quickly and positively, and made of relatively soft material since the light pressure of the stylus results in no appreciable wear.

Hydra-Feed states that finish possible with the lathe either does away with second operations or cuts grinding stock in half. Changeover can normally be completed in ten minutes.

Chip flow is unobstructed through full-width, full-depth chip chute. Automatic chip removal equipment can be installed. Lathe conforms to JIC hydraulic and electrical standards.

Hydra-Feed Machine Tool Corp, 730 W Eight Mile Rd, Ferndale, Mich



Internal Collets

Holding tool for use on lathes and grinders eliminates arbors, lathe dogs, arbor presses, and other tools. Collets are self-releasing and fit standard 5C lever and handwheel drawbars. With all parts and pads hardened and ground, tolerances to 0.0001 in. are achieved by touch-grinding pads or machinable pads with given setups.

Collets and pads are available individually or in Task Master set.

Royal Products, 88 Union St, Mineola, LI, NY

. . . including

MACHINE TOOLS AND ATTACHMENTS

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Large-Swing Lathe ..... page 184
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CLEANING AND INSPECTION

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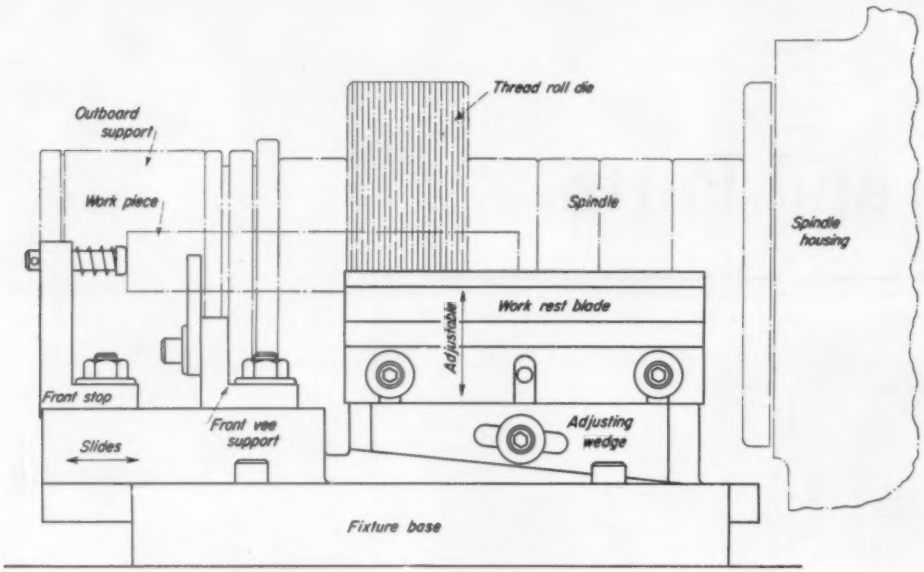
Overhead Conveyor ..... page 182
Handling System ..... page 182



WORK REST FOR INFEED ROLLING

INFEED or plunge rolling is generally used where a thread length of 5⅜ in. or less is required. Continuously threaded roll dies are used on both spindles. Desired thread diameter is produced as machine cycle advances right hand roll to a predetermined distance from left hand roll. Automatic timing is provided for actual period during which rolls are engaged with workpiece, and is independent of time required to advance and retract spindle slide. Dwell time for loading may be incorporated into machine cycle for a completely automatic operation. Hopper or magazine feeding can be used with automatic cycle if total workpiece length is less than 7 in. For semi-automatic operation dwell time for loading is independent of machine cycle as each cycle is initiated by operator after work loading. Infeed rolling offers a minimum endwise travel of work which enables close-to-the-shoulder threading.

Landis Redesigns German Thread-Rolling Machine

The Lanhyrol thread-rolling machine, Landis Machine Co's complete redesign of the German Pee-Wee thread roller, now meets U S standards with JIC controls, heavier construction, and other technological developments.

The Lanhyrol is designed to produce 3/16- to 3-in.-dia, left- or right-hand threads of all types, except square and high taper. Class 2 and 3 threads are formed by the high-production continuous rolling method. Class 4 threads can be consistently maintained by the infeed, thrufeed, and reciprocal rolling methods. Standard thread forms include UN pitches from 5 to 32 tpi; Acme, 6 or more tpi; worm threads equivalent to 8-dia pitch and finer can be rolled under normal conditions. Threads may be rolled on hollow, extremely long, and odd-shaped parts through use of auxiliary equipment.

Two thread roll dies are power driven and are mounted on parallel horizontal spindles. One spindle rotates in a stationary bearing support; the other in a movable bearing support actuated by hydraulic pressure. Landis states that this design principle enables high production, application flexibility, and wide-range coverage producing strong, accurate threads of excellent finish in a chipless, cold-forming process.

A 7½-constant-hp two-speed motor with V-belt drive to speed-change gearbox delivers 14 to 126 rpm in 16 steps, using four pairs of "pick off" gears. Splined drive shafts and heavy-dutv universal joints connect speed change unit with final drive mechanism in spindle housings. Final drive is accomplished through a heavy-duty worm and worm wheel speed reducer to a pair of helical gears. Worm drive with a 9½-in.-dia worm wheel delivers more power and sustains increased life because of lower tooth pressure.

Special heavy-duty roller-type bearings support the hardened alloy steel spindles. Three individual straight bearings are encased in a one piece outer and inner bearing race. ID of inner race has a fast taper corresponding to tapered section of spindle to eliminate radial clearance in bearings.

The hydraulic cylinder for the right hand spindle has a size-adjusting screw and stroke-adjusting mechanism. Combination of these into a single unit of "in-line" design reduces deflections from rolling forces to a minimum.

Variable hydraulic pressure is delivered to the piston which applies force between rolls and work. Design of operating cylinder eliminates overloading of dies and machine if oversized or improperly heat-treated pieces are accidently loaded between rolls.

Size control is accomplished by a crank which moves the right-hand spindle housing. A micrometer dial on the adjusting screw facilitates accurate adjustment to pitch diameter. Constant size retention is assured by spinner nut locked to adjustment screw.

Movable spindle slide contacts a positive stop during rolling process thereby making it possible to maintain a tolerance on thread pitch diameter to ± .0001 in.

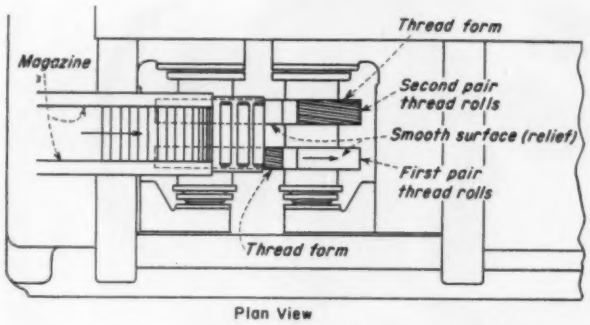
Maximum stroke of ¾ in. is provided for loading and unloading. Large handwheel provides infinite stroke adjustments so that shortest stroke, as determined by design of workpiece, may be used to reduce idle cycle time to a minimum. A swivel, with a sensitive adjustment and positive lock, permits correction or generation of slight tapers when necessary.

Synchronization of rolling dies is accomplished through a separate coupling on drive shaft of left-hand spindle. This allows left-hand roll to be independently rotated by a handwheel until both rolls are in phase. Another unit on same spindle permits endwise adjustment to 0.100 in. for positioning dies directly opposite each other.

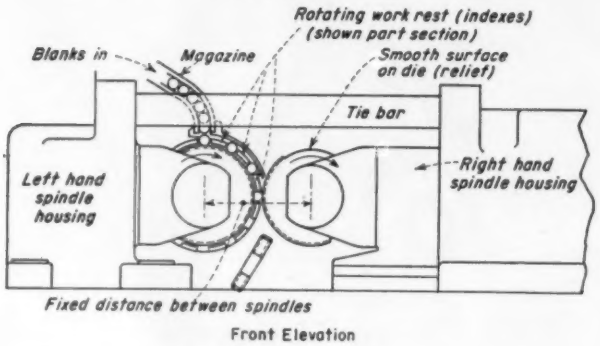
The outer ways of the movable spindle housing are rectangular to insure balance. Between them is a center guide for positive alignment (squareness) and elimination of skewing.

Thread rolls are 8-in.-max. dia, and rolling pressure is variable to 18 tons. Base price of machine without tooling is $16,500.

Landis Machine Co., Waynesboro, Pa



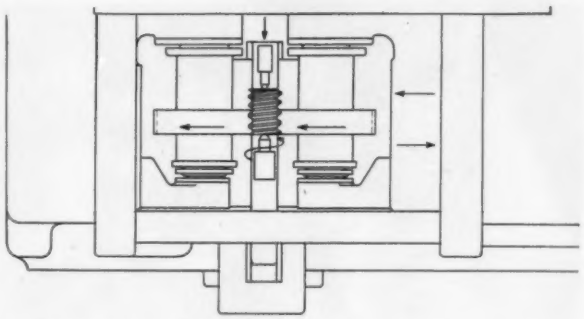
Plan View



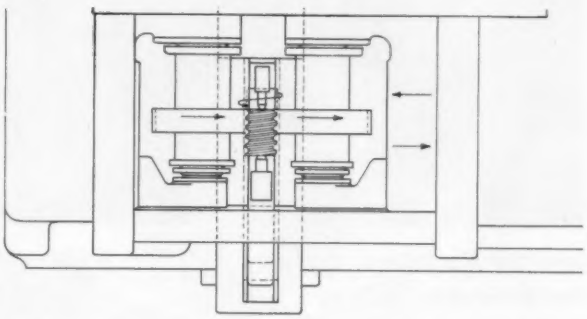
Front Elevation

CONTINUOUS ROLLING

CONTINUOUS ROLLING is used for high production threading of studs 5⅞ in. or less in length, requiring threads at one or both ends. Two pairs of dies are used, each having thread forms on approx ½ of circumference with remaining portion smooth. In this manner, one end of stud is threaded in ½ rev of dies, while smooth surface of second pair of dies functions as steady rest for stud. Opposite end of stud is threaded by reverse action of dies. Studs having two threads of different pitches and/or diameters can be threaded in a single pass, since each end of stud is rolled independently. Headed workpieces ¾ in. or less in diameter, maxamim overall length of 7 in., with under the head length of 6 in. max., and of medium hardness, can also be rolled. This method utilizes one continuously threaded roll die and one segmental die, with both rolls at a fixed center distance equal to pitch diameter. One, two, or three pieces are threaded for each revolution of rolls, depending on number of segments in the one roll die. Work is delivered from a hopper or magazine-feeding mechanism to a revolving cage workrest that indexes the pieces into and away from rolling position. Indexing is in timed relation to correspond to arrival of blank section of segmental die at rolling position

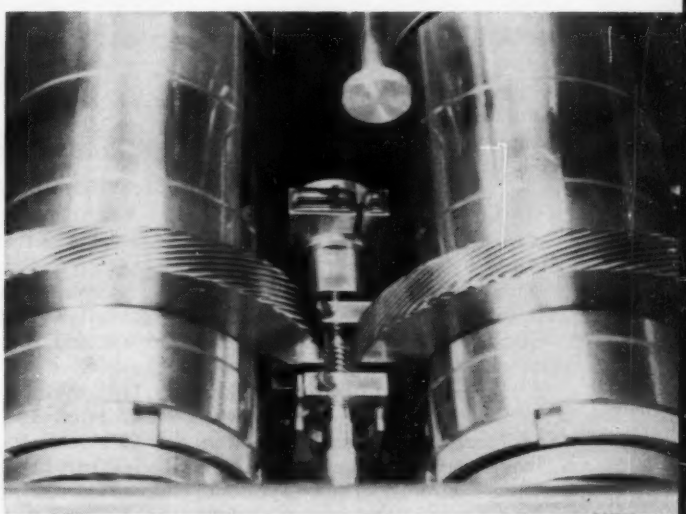


RECIPROCAL ROLLING (first position)



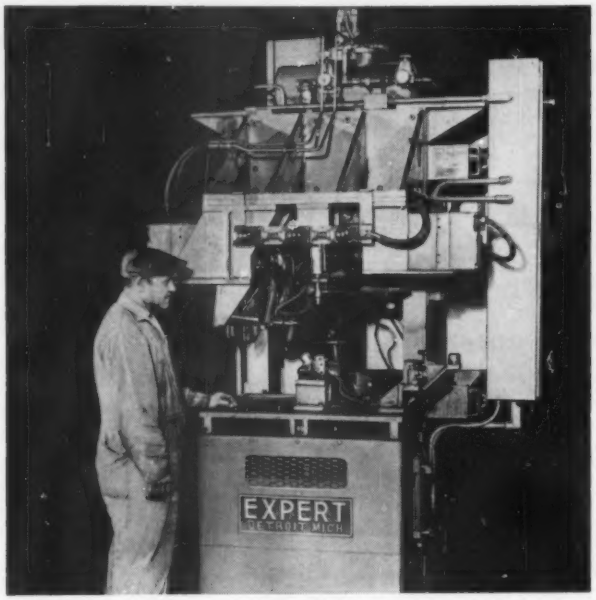
RECIPROCAL ROLLING (second position)

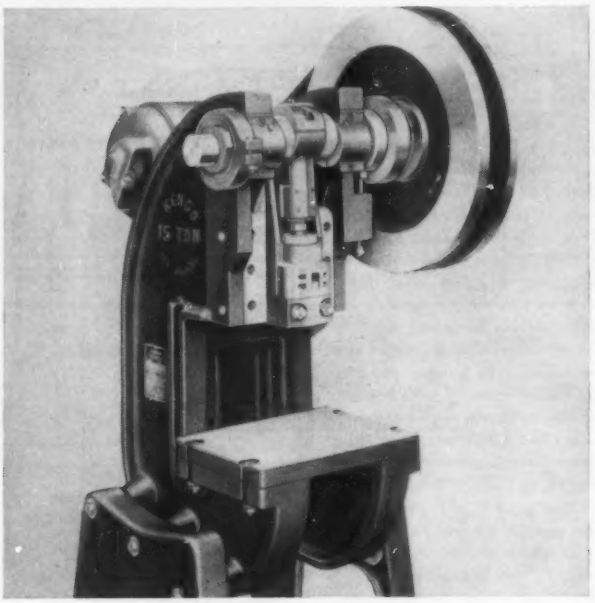
RECIPROCAL ROLLING is designed for producing coarse pitch threads on materials of relatively high hardness R_c 38 such as worms or helical gears. Work is loaded in manually operated center-type or mandrel fixture. Right-hand roll is then advanced towards fixed roll under hydraulic pressure. Pressure is controlled so full thread depth cannot be reached in one revolution of work. During rolling operation, as right-hand roll slowly advances to required thread depth, the work moves endwise because of nut action between rolls and partially formed threads. To permit this endwise movement, the workholding fixture operates in a slide. When fixture has moved a predetermined distance, direction of rotation of rolls is reversed and work moves endwise in opposite direction. Cycle is repeated until required thread depth is obtained



SPECIFICATIONS FOR JOB ABOVE CALLED FOR:

- ⅜-in. diameter stud 2½-in. in length
- 16 pitch (Thds per inch) NC thread to Class 5 tolerance on one end
- 24 pitch NF thread to Class 3 tolerances on other end
- thread length for both ends is ⅝-in.
- material is cold drawn wire 8615





Inverted Mechanical Presses For Resistance Welding

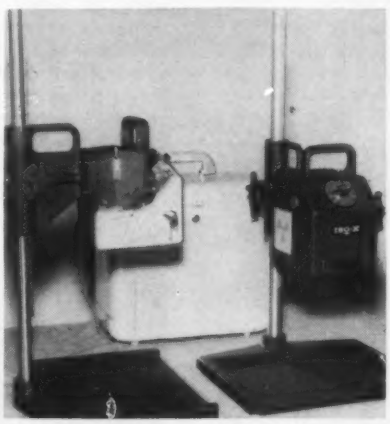
A new line of compact low-tonnage inverted mechanical presses designed for a variety of spot and projection resistance welding operations includes standard 32, 42, and 60-in. models, each having adjustable strokes of 5, 6, and 8 in. The presses are rated at 2-ton capacity having large upper and lower platen areas which extend their application. Maximum operating speed is 2200 strokes per hour. Both upper and lower platens have accurately spaced tapped holes to permit quick change-over from one electrode and fixture or die arrangement to another.

Presses feature self-contained mechanical drive unit called mechanical knee. Unit is mounted in base and raises and lowers the lower platen through a double scotch-yoke mechanism driven by a 2-hp motor, clutch, brake, and double-end worm-gear speed reducer arrangement. Clutch and brake are combined in specially adapted unit that stops platen in up or down position while the motor and flywheel run at constant speed.

The lower platen unit is of welded construction and is guided by four bars which slide in bronze bushings in the platen structure. Two air cylinders, one on each side of platen, are connected to a surge tank in a closed air circuit. These cylinders provide a pneumatic counterweight capable of balancing a 2000-lb load at 80-psi pressure.

Electric controls for the mechanical presses are in a panel enclosure on either side of the C-frame. Electronic controls are in a cabinet on the other side. Welding gun air controls are mounted on top. The 31-in. press has a 33-in.-wide by 27-in.-deep knee platen area. The 42-in. press has a 43-in.-wide by 27-in.-platen; the 60-in. press has a 61-in.-wide by 27-in. platen.

Expert Welding Machine Div, 17144 Mt Elliott Ave, Detroit 12, Mich



Portable Atomic X-Ray

ISO-X, an isotope X-ray machine weighing less than 20 lb, uses as its X-ray source the radioactive isotope of rare earth, thulium 170. The unit does not require electricity. It is safe to use and requires no special precautions.

The thulium is enclosed in an aluminum capsule, itself encased by lead shielding. Bulit-in timer provides for precise preset exposures up to 60 sec. When intensity of isotope drops to certain level, within six months to a year, the thulium capsule is replaced. The unit is reported well suited for the inspection of metal castings, forgings, and welds.

Litton Industries, Nuclear Electronics Div, Beverly Hills, Calif

Kenco Punch Press Has 15-Ton Capacity

A new 15-ton punch press rounds out the line of small presses which Kenco states is designed for fast precision stamping, minimum downtime, and long service life.

Construction features include solid one-piece alloy steel crankshaft, heat-treated and precision ground with pin diameter of 2⅜ in. Flywheel is carried on two roller bearings. It is 20 in. in dia and weighs 200 lb. Extra-long V-type ramways give precision guidance throughout most of ram-travel distance. Press frame, like the ramways, is a Sorbomat casting. Ram hole is 1 9/16 in. accommodating standard die sets. Ram area front to back and right to left, is 4x5 in. Distance from center of ram to back of press is 6 in. Bolster plate area is 11x14 in.

Driving mechanism is contained in the clutch collar and requires no weakening slots in crankshaft. To insure long-wearing drive, the flywheel is fitted with companion drive, heat-treated and precision ground.

Kenco Mfg. Co, 5211 Telegraph Rd, Los Angeles 22, Calif

Flexible Couplings

Flexible couplings, Climax QD heavy-duty line, are equipped with split-taper bushings for quick mounting and for connecting shafts of different sizes. "Knob-disk" flexible member enables coupling to absorb shock and misalignment. Units are available in eight sizes based on horsepower ratings up to 75 hp at 100 rpm.

Climax Metal Products Co, 863 E 140th St, Cleveland 10, Ohio

New Automatic Power Saw Cuts Cut-off Costs 50% and More!

You can drastically reduce cut-off costs through savings in time, labor and material with the new DoALL Power Saw. Using DoALL's new high-speed steel Demon Band Tool, this saw *cuts faster than any other machine in the world* of comparable price and capacity, including power hack saws.

DoALL

The DoALL Company
Des Plaines, ILL., U.S.A.

. . . turn the page for details.

NEW
MACHINING TEAM

DoALL Power Saw . . . Outperforms All Others!

★CUTS FASTER—cuts 25% to more than 50% faster than power hack saws of comparable capacity and price . . . pays off fast in labor savings and higher output per machine.

★SAVES MATERIAL—just compare the 1/16" kerf cut by the thin, continuous cutting DoALL band tool with the 1/8" kerf of hack saw blades or 1/4" cut of a cold saw . . . you save 1/2" or more of costly stock every 8 cuts!

★LOW TOOL COST—the new DoALL Demon High-Speed Steel band tool lasts up to 10 times longer than previous carbon steel saw bands . . . you get tremendous output per dollar of tool cost!

★CAPACITY UP to 12" rounds, 12" x 12" flats.

You can put a terrific cutting load on a Demon Blade—*a continuous band of high-speed steel.* It retains its hardness up to 1100°F compared to only 350° for carbon steel blades. Available in Precision and Buttress type . . . in welded bands to fit the DoALL Power Saw . . . 1" wide . . . 2 to 10 pitch depending on material to be sawed.

Demon Precision HIGH-SPEED STEEL

Demon Buttress HIGH-SPEED STEEL

DoALL

THE new DoALL Power Saw and DoALL Demon high-speed steel band tool is the most productive cut-off team ever developed. *Continuous* high-speed cutting . . . stock-saving narrow kerf . . . great accuracy . . . straight cuts . . . good finish . . . automatic operation . . . minimum floor space . . . hydraulic controls . . . easy operation . . . low maintenance—all these and more cost-reducing benefits accrue to its users.

FULL AUTOMATIC or MANUAL FEED—models available with fully automatic feeding, indexing and sawing for high volume production, or with manual feed when desired.

VARIABLE SPEED—90 to 350 FPM for greatest sawing versatility and efficiency. Step or single speed drives optional.

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MACHINES AND ATTACHMENTS

1 HORIZONTAL BORING, DRILLING, & MILLING MACHINES—*Portage Machine Co, Akron 11, Ohio.* Catalog lists specifications and illustrates design features of 4-in.-spindle diameter units. Includes special attachments and controls.

2 DIE-CASTING MACHINE — *Cleveland Automatic Machine Co, Cincinnati 12, Ohio.* 4-page bulletin illustrates Model 200 high-pressure hydraulic unit for zinc, tin, or lead. Hot metal end can be changed to convert to cold chamber machine. Features described, specifications and optional equipment outlined.

3 ELECTROLYTIC GRINDING—*Anocut Engineering Co, Chicago 6, Ill.* 12-page illustrated manual describes automatic process for grinding of cemented carbide tools and other hard-to-work materials. Covers equipment, applications, operational data, costs savings.

4 TESTING MACHINES—*Riehle Testing Machines Div, American Machine & Metals, Inc, East Moline, Ill.* 8-page selection guide, bulletin RG-14-55, contains illustrated information on range of machines, instruments and accessories.

5 FORGING HAMMER — *Lobdell United Div, United Engineering & Foundry Co, Wilmington 99, Del.* 20-page illustrated catalog gives detailed descriptions of line of Nazel electro-pneumatic, self-contained units. Specifications, examples of installations, operational data, applications included.

6 RIGIDMILS — *Sundstrand Machine Tool Co, Rockford, Ill.* 4-page circular on machines for miscellaneous die-block milling; two heavy-duty models (55 and 77) described; a sequence of operations illustrated, as well as optional features and extras.

7 AUTOMATIC NUT FORMERS — *Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 8-page bulletin 930-A-2 covers line of multiple-die, single-stroke transfer headers for producing cold forged, finished blanks; rates range from 60 to 125 per minute. Includes design and operational details, tabular specifications.

8 HIGH-SPEED HEADS — *Precise Products Corp, Racine, Wis.* 20-page general catalog FGH-2 covers power quills, grinder millers, high rpm milling machines, drillpresses, speed lathes for small parts. Applications and accessories illustrated.

9 HYDRAULIC COPYING EQUIPMENT—*Armytage Bros, Ltd, Foundry Lane, Knottingley, Yorkshire, England.* 16-page illustrated brochure describes Hypronic universal equipment for profiling and 2 and 3 dimensional machining on lathes, shapers, planers, boring, and grinding machines.

TOOLS AND ACCESSORIES

10 INSERT BITS & HOLDERS — *Continental Screw Co, New Bedford, Mass.* 14-page booklet covers Hy-Pro Phillips bits for driving Phillips screws. Line drawings illustrate design features; case histories on applications included.

● OPTICAL MEASURING & INSPECTION EQUIPMENT—*George Scherr Optical Tools, Inc, New York 12, NY.* 70-page booklet on full line of Leitz instruments contains basic details and specifications. Request direct on company letterhead.

11 LUBRICATION CHART — *E F Houghton & Co, Philadelphia 33, Pa.* Wall chart containing recommendations covers such applications as hydraulic systems, spindles, air compressors, reduction gears, electric motors, etc.

12 TOOLROOM VISE — *Producto Machine Co, Bridgeport 1, Conn.* Bulletin TE2-103 illustrates and describes 13-lb unit for use on jig borers, surface grinders, drillpresses, and tappers; clamps heavy as well as light work.

13 TOOLHOLDERS — *Vascoloy-Ramet Corp, Waukegan, Ill.* 12-page catalog VR-435B contains detailed, illustrated information on RBR-RBL toolholders, with 35° end clearance angle, for round throw-away carbide blanks and round 1½-in.-long inserts. Additional styles included for varied applications, as well as lowered price lists.

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AMERICAN MACHINIST, New York *Not good after* June 25, 1955

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AMERICAN MACHINIST, New York *Not good after* June 25, 1955

FILL IN BELOW NUMBER OF ONE CATALOG WANTED ○

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AMERICAN MACHINIST, New York *Not good after* June 25, 1955

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New York 36, N. Y.

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FYI
FOR YOUR INFORMATION

14 DIE FILING EQUIPMENT — *Nord International Corp, Orange, NJ.* 6-page illustrated brochure describes the Di-Profiler, a hand tool that mechanically scraps, hones, mills, files, polishes, saws, laps, grinds, and engraves. Applications and accessories included.

15 LUBRICANT — *The Alpha Corp, Stamford, Conn.* 2-page bulletin 102 gives detailed description of Moly-Spray-Kote, a dry lubricating film for prevention of seizing, galling, and welding of metal parts; for cold-forming operations, and reciprocating parts. Packaged in a self-pressurized aerosol sprayer.

16 TAPS—*Besly-Welles Corp, Beloit, Wis.* Catalog 80 illustrates complete line with tabular data on sizes and prices, and recommendations for various classes of fits. Includes simplified guide to new tap marking system, with conversion table for changing old designations to new.

● PARALLEL EDGE SCRIBER—*Dayton Roger Mfg Co, Minneapolis 7, Minn.* Gage, graduated by 16ths from 1/8 to 1 in. for scribing parallel lines from a given edge of a piece of sheet or stock material. Request direct on company letterhead.

HEAT TREATING AND WELDING

17 FURNACE & OVEN CONTROLS—*Bristol Co, Waterbury 20, Conn.* 48-page illustrated bulletin P1260, a price list and specification catalog of instruments and accessories, contains engineering data for proper selection; describes all components required for heating applications.

18 STUD WELDING—*K S M Products, Stud Welding Div, Merchantville 8, NJ.* 16-page illustrated booklet covers ordering and engineering data on twelve most commonly used studs. Applications and equipment included.

19 INDUCTION HEATING — *Lepel High Frequency Laboratories, Woodside 77, New York, NY.* 4-page folder gives engineering data on principles and practical application. Two units (Models T-20-3 and T-30-3) illustrated, with specifications.

PLANT SERVICE EQUIPMENT

20 MATERIAL HANDLING — *Edison Storage Battery Div, Thomas A Edison, Inc, West Orange, NJ* 32-page illustrated booklet covers industrial trucks with material-handling attachments. Contains sections on unit-load principle, power requirements, characteristics of nickel-iron-alkaline storage batteries.

21 CENTRIFUGAL PUMPS—*Ingersoll-Rand, Cameron Pump Div, New York 4, NY.* 24-page bulletin, Form 7093-E, covers complete line of close-coupled Motor-pumps from ¼ to 75-hp sizes for delivery of 5 to 2800 gpm. Each class illustrated with detailed description; design features and advantages outlined; selection data, specifications, performances, and mountings included.

22 SMALL PARTS HANDLING — *Chas Wm Doepke Mfg Co, Rossmoyne, Ohio.* 8-page catalog DN-1000 illustrates complete line of NesTier equipment. Contains descriptions and specifications of nesting-stacking boxes and baskets, Rollover hoppers, hopper rack assemblies, and shelf racks, used singly or in combinations.

23 COOLANT ODORS—*S C Johnson & Son, Racine, Wis.* Booklet, "How to Stop Foul Coolant Odors," describes causes and procedure necessary to eliminate odors caused by rancid water soluble coolants.

24 CHAIN & SLINGS—*McKay Co, Pittsburgh 22, Pa.* 8-page bulletin AA covers U-Loy line; details on uses, properties, advantages of double-U welded chain made from high alloy steels in material diameters up to 2 in. Charts indicate attachments to use and loads which can be lifted with these slings.

25 PROTECTIVE COATINGS—*Carboline Co, St Louis 18, Mo.* 4-page bulletin 600 describes modifications of Phenoline 300 for use as tank linings, severe maintenance painting, and floor coverings in acid, alkali, and solvent environments. Includes recommended uses and applications, operational chart.

PARTS AND MATERIALS

26 CONTROL DEVICES—*General Electric Co, General Purpose Control Dept, Schenectady 5, NY.* 68-page illustrated catalog GEC-1260A contains wiring diagrams and dimensions on motor starters, contactors, relays, solenoids, switches, push-buttons, and pilot devices. Special section correlates by horsepower components for each type of motor control application.

27 MATERIALS SPECIFICATIONS—*Shieldalloy Corp, New York 16, NY.* 37-page book gives chemical and screen analyses for powder metals and alloys, processed minerals and ores, and chemical analyses of metals and alloys. Among materials described are chromium metal, titanium-aluminum master alloy, powdered ferro-alloys and melting base alloy, processed fluorspar, rutile, and zircon. Primarily prepared for the welding rod manufacturing industry, materials have wide range of application.

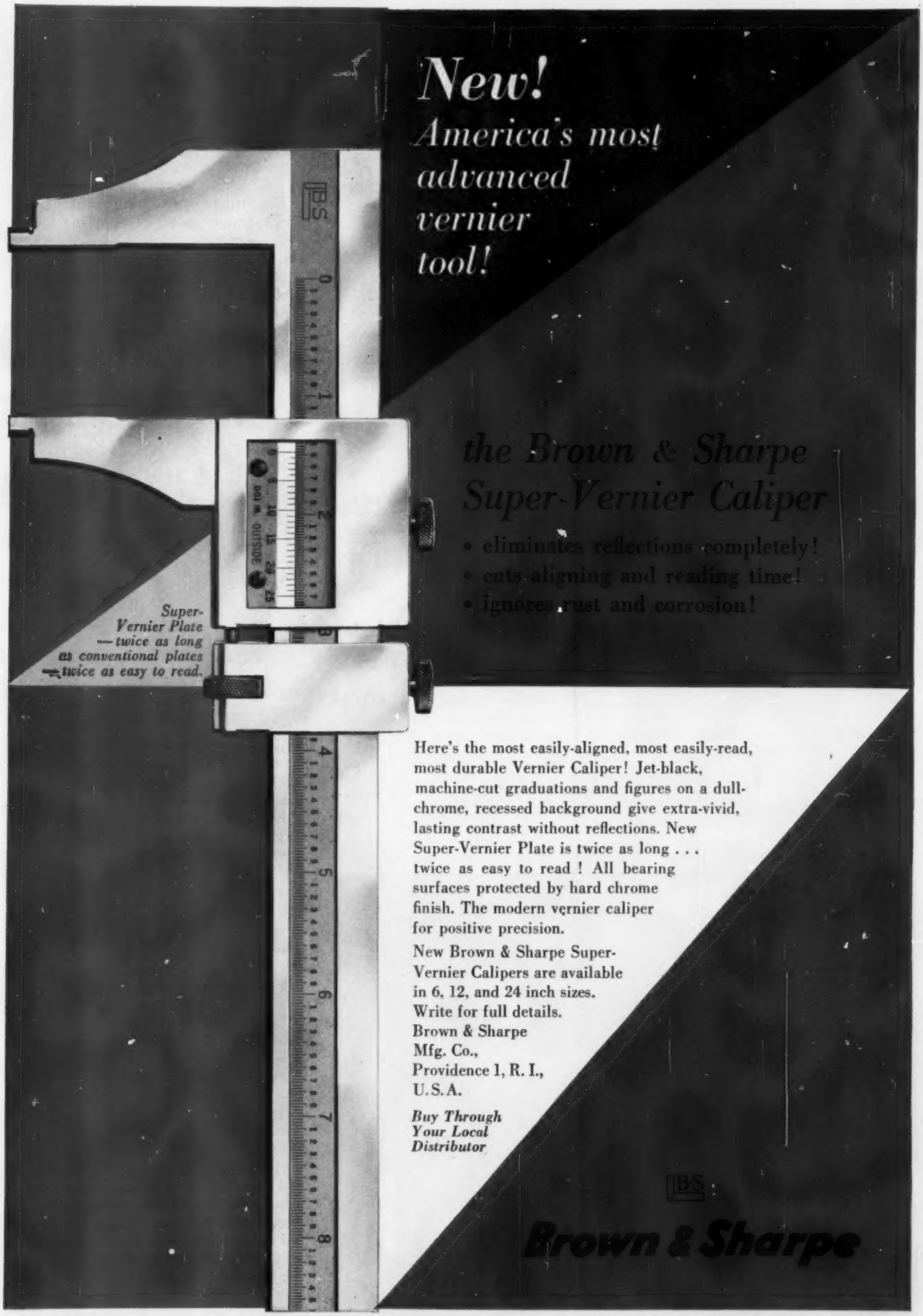
28 HYDRAULIC STANDARDS—*Miller Fluid Power Co, Melrose Park, Ill.* 20-page illustrated pamphlet, hole-punched for insertion in standard catalogs, presents JIC standards, recommended practices on packings and seals, examples of packing code identification, glossary of terms.

29 AIR CONTROL VALVES—*Airmatic Valve, Inc, Cleveland 9, Ohio.* 66-page catalog illustrates entire line of 2-way, 3-way, and 4-way units for high or low-pressure installations. Single and double-acting cylinders for air or hydraulic use, and strainers for pipeline protection included.

30 NYLON PRESSURE TUBING — *Polymer Corp of Pennsylvania, Reading Pa.* 6-page illustrated bulletin describes flexible Nylaflow for airlines, process lines, coolant, fuel and oil, lubricant, and hydraulic lines Covers characteristics, properties, installation data.

31 DUCTILE IRON — *International Nickel Co, New York 5, NY.* 30-page illustrated booklet DI-25 describes material with process advantages of cast iron and strength and ductility of steel. Includes case histories, specification tables for seven main types, and charts comparing mechanical properties.

AMERICAN MACHINIST, New York Not good after June 25, 1955


New!
America's most advanced vernier tool!
the Brown & Sharpe Super-Vernier Caliper
• eliminates reflections completely!
• cuts aligning and reading time!
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Super-Vernier Plate — twice as long as conventional plates — twice as easy to read.
Here's the most easily-aligned, most easily-read, most durable Vernier Caliper! Jet-black, machine-cut graduations and figures on a dull-chrome, recessed background give extra-vivid, lasting contrast without reflections. New Super-Vernier Plate is twice as long . . . twice as easy to read ! All bearing surfaces protected by hard chrome finish. The modern vernier caliper for positive precision.
New Brown & Sharpe Super-Vernier Calipers are available in 6, 12, and 24 inch sizes. Write for full details.
Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.
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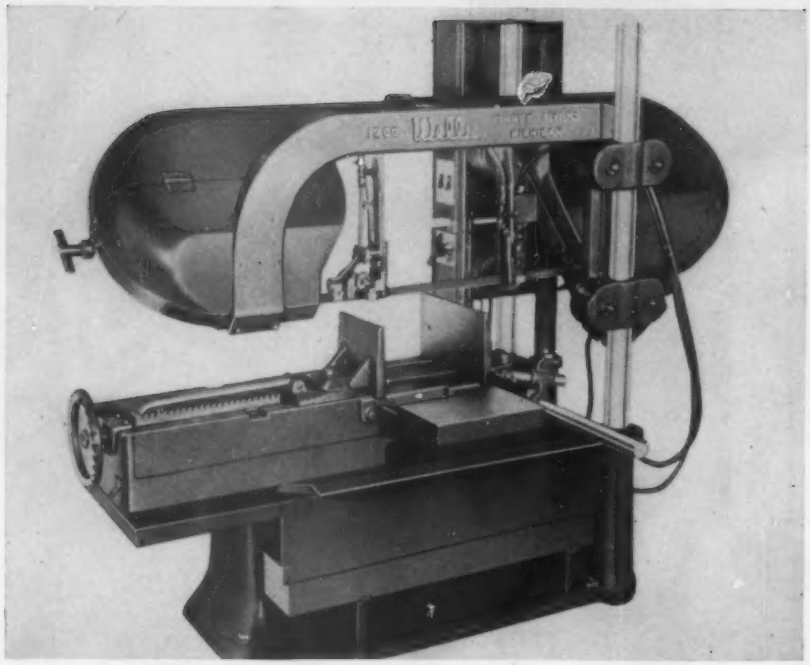
Visit Booth 520 at The Machine Tool Show

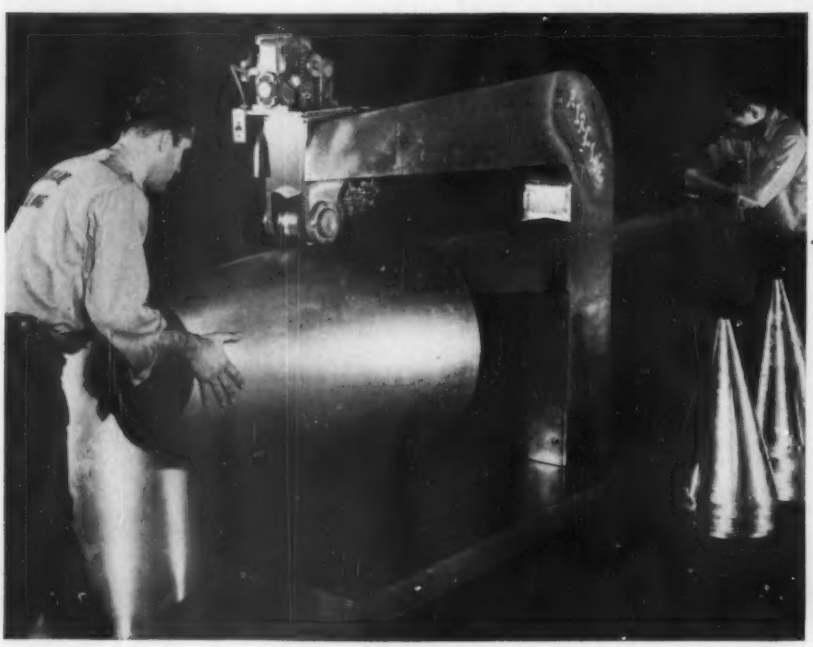


Metalcutting Bandsaw Is Hydraulically Operated

Model 1200 heavy-duty hydraulically operated, metalcutting bandsaw includes such features as: new electrical system providing overload and low voltage protection, and 110 volts at controls for greater safety; push-buttons and other controls located at convenient height; new blade-pressure controls with wide range of uniform feeding pressures; automatic cutting cycle; special chip flushing unit; heavy duty adjustable blade guides; fool-proof blade tensioning; adjustable stops for die-block depth cutting; and rigid positive stock stop.

The saw has a capacity of 12¾ in. for rounds; 12x16 in. and 11x18 in. for rectangular shapes. Driven by a 1-hp motor, the blade (13½ ft x 1 in. x .035 in.) can be operated at speeds of 60, 115, 200, or 300 fpm.

Wells Mfg Corp, 505 Roosevelt Rd, Three Rivers, Mich



◀ AUTOMATIC WELD AREA PLANISHING ROLL provides controlled pressures for rolling welds on steel, titanium, aluminum and other metals. It smooths fusion welds and increases physical properties as well as refining the grain of weld and adjacent area. By providing controlled cold working of weld and heat affected zone, it reduces grinding operations, assists spinning, bulge forming, and sizing operations. It will roll welds on flat sheets, cylinders, and cones with diameters from 1¾ in. to 10 ft and lengths to 10 ft — *Airline Welding and Engineering, 785 North Prairie Ave, Hawthorne, Calif*

General Purpose AC Welder

Type WK29A, covering current range of 25 to 295 amp, is designed for maintenance work, tack welding at high currents, and steady welding at moderate currents. Provides a 50% duty cycle in normal welding range of 200 amp.

Low-range open-circuit voltage of 75 v provides easier starting and facilitates use of low hydrogen and stainless electrodes. A 65-v OCV is supplied at high current settings. Model includes a dual-position range switch, 230-v primary circuit, steel-tired casters as standard equipment.

General Electric Co, Schenectady 5, NY

High-Speed Grinder Uses Abrasive-Coated-Cloth Disk

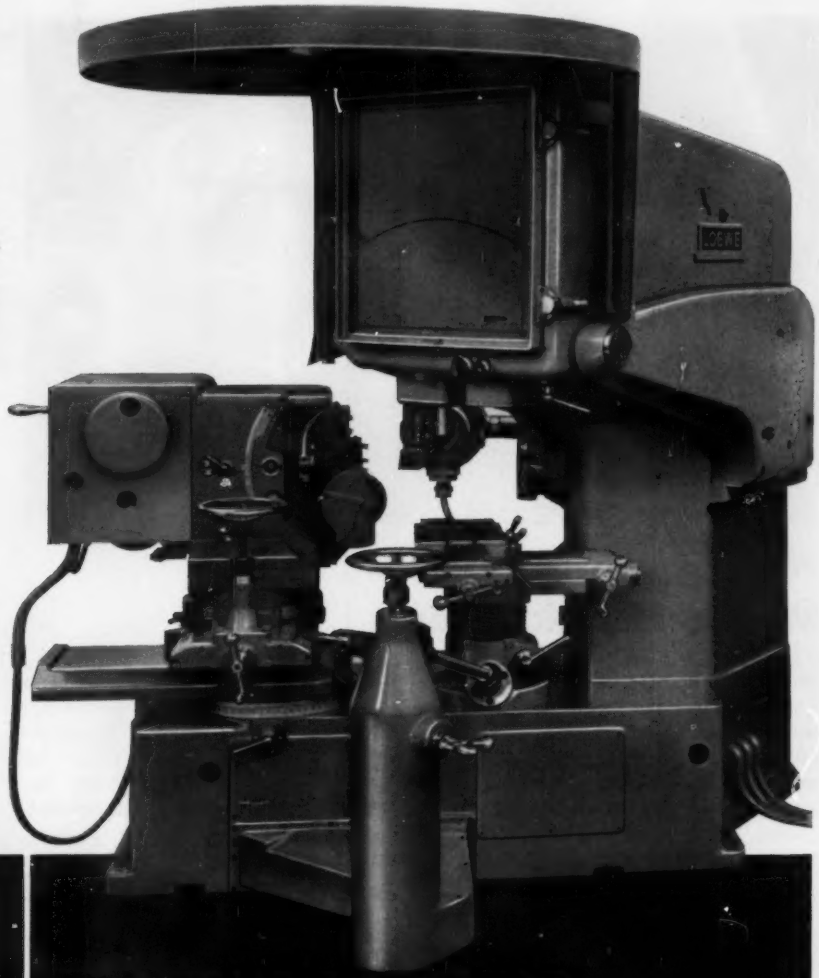
The Neeco-2-Twenty abrasive-coated-cloth disk grinder is a 20-in.-dia double-disk machine powered with 10-hp motor to handle heaviest removal loads without reducing disk speed. New Era reports that through the development of a special method of processing abrasive-coated-cloth disks the grinder operates at a perimeter speed of more than 18,000 fpm.

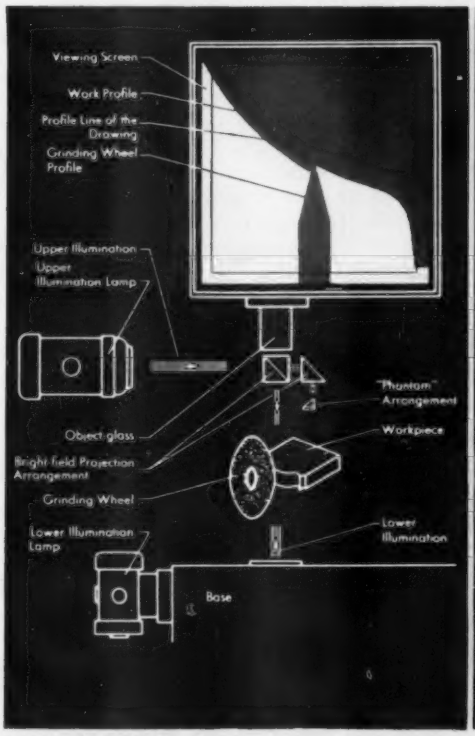
New Era Engineering Co, 458 W 29th St, Chicago 16, Ill

OPTICAL PROFILE GRINDER

MODEL "SP"

FOR PUNCHES • SECTIONAL DIES
GAGES • TEMPLATES
FLAT AND CIRCULAR FORM TOOLS





- ★ Eye-ease, full view projection screen 20"x20"
- ★ Operator may stand up or sit down, eliminating fatigue
- ★ All forms can be ground with equal ease, speed and precision on this most up-to-date grinder
- ★ Two built-in optical magnifications 25x and 50x finger-tip controlled
- ★ Dual complete lighting systems for Shadowgraph and reflected Projection
- ★ "Vanishing" shadow of grinding wheel eliminated by steadily projected "Phantom"

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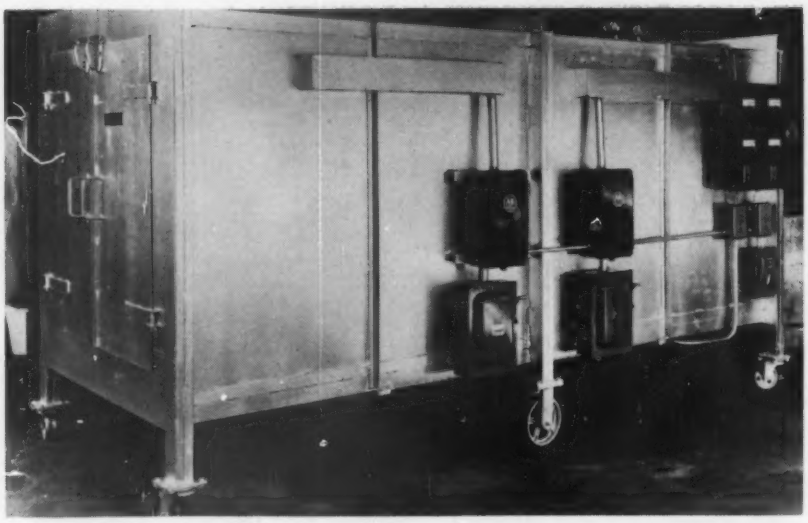
WE INVITE YOUR INQUIRIES ALSO FOR ENGINE LATHES; PRODUCTION LATHES; COPYING LATHES; PROGRAMMING LATHES; TOOL ROOM LATHES; CAMSHAFT TURNING LATHES; HORIZONTAL, VERTICAL AND UNIVERSAL MILLING MACHINES OF VARIOUS SIZES; TOOL AND CUTTER GRINDERS AND REAMER HONING MACHINES



Waltz Furnace Installs Mobile Electric Oven

Waltz Furnace Co recently installed a mobile electric oven for a large manufacturer of aluminum products. Oven is mounted on sturdy swivel wheels for easy movement and designed for preheating aluminum sheets. It is capable of producing temperatures to 750 F. Unit has a roller hearth and working space 4 ft wide, 4 ft high and 12½ ft long. Simple controls regulate temperature. With all controls in place the 90-kw oven is delivered ready for connection to 440-v, 3-phase current.

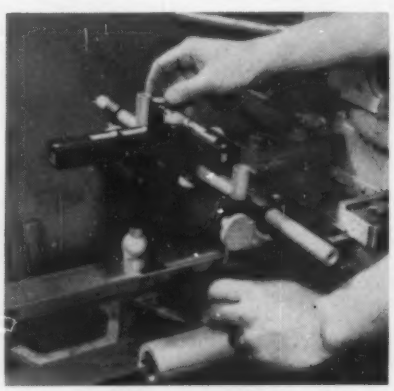
Waltz Furnace Co, Dept 1, Symmes St, Cincinnati, Ohio

Barry Adds Spring Unit To Mobile Machinery Mount Line

Barry spring mounts for isolating low speeds and high impact applications are designed for use where high absorption of vibration is necessary, or where soft floors make control of vibration frequencies difficult.

Available in five sizes, with 1, 2, 4, 6, or 9 springs, the units, depending on size, have an effective load range of from 250 to 6700 lb per mount. Since bolts or shims are unnecessary when mounting, machines can be installed and leveled within minutes. Each mount has a built-in adjustment which permits leveling up to ¾ in. Simple damping adjustments can be made to prevent sudden spring recoil when mount is subject to heavy impact and shock and when machine goes through resonance, thus checking excessive motion or bounce.

Barry Corp, Watertown, Mass

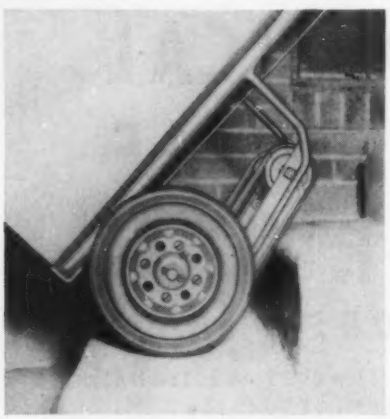


Precision Aligner Adapts To All Machine Tools

A precision aligner introduced by King Instrument, developed for both production line checking and for use in machine tool rebuilding shops, is adaptable to all machine tools without additional parts. It is reported accurate to 0.0003 inch per foot of extension and can measure parallel, horizontal, and vertical alignment simultaneously. Unit is said to be easy to operate and to allow machine alignment in less time than was required when levels, sighting scopes, and like methods were used.

The King-Way aligner comes complete with shafts, so that various dial indicators can be used, and with complete instructions.

King Instrument Co, Dept KP, 804 Northwest Bank Bldg, Minneapolis 9, Minn



Handtrucks Incorporate New Stair Glides

Line of trucks equipped with nonmar and easy-operating stair glides have glide assemblies equipped with rubberized-fabric V-belts which cannot damage stairs having finished surfaces. Glide assemblies are positioned to permit smooth movement parallel to slope of curbs or stairs, rather than intermittent raising and lowering of load.

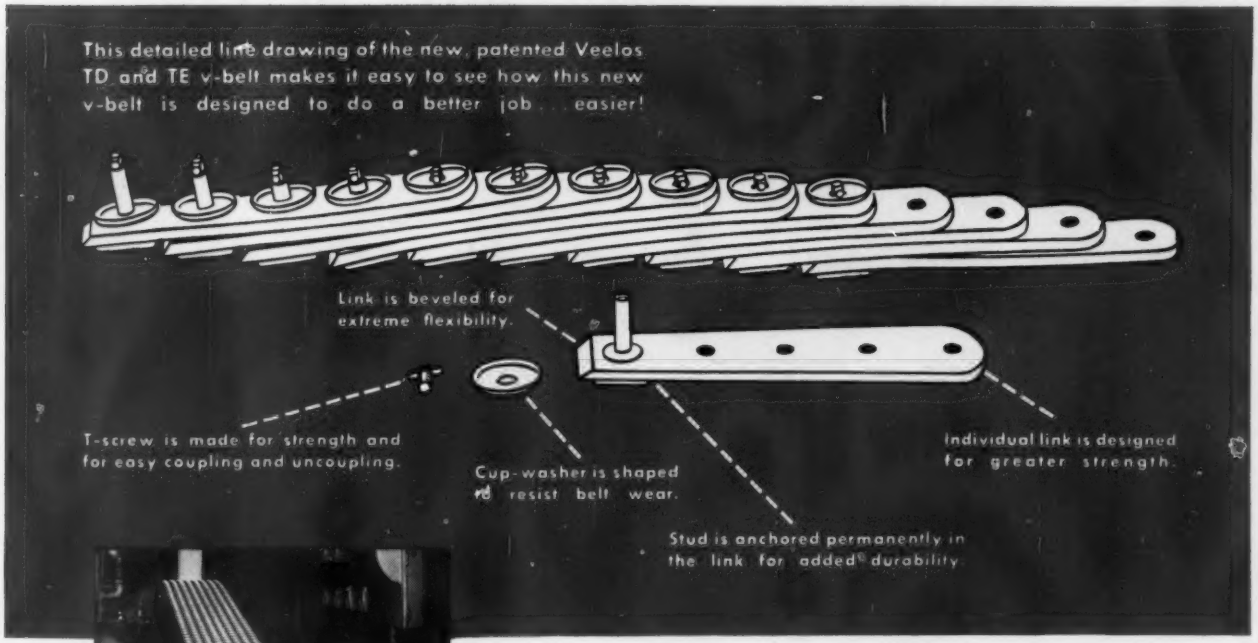
Trucks are constructed of all electrically welded tubular steel with choice of single or double handles and open or solid plate noses in 5, 7, or 9-in. lengths. Frame sizes are 14x47 in. high with choice of 6- or 10-in. roller bearing, semi-pneumatic rubber-tired wheels.

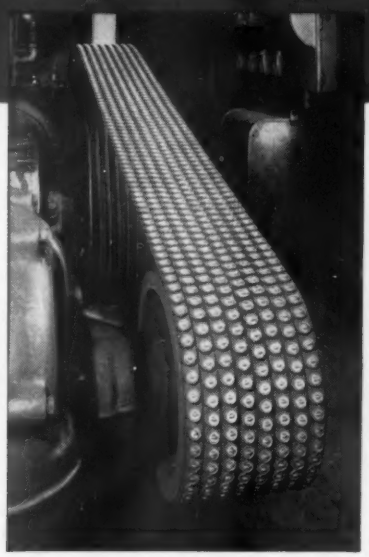
Nutting Truck and Caster Co, Faribault, Minn

Layout Plan

Starter layout plant for concerns wishing to develop their own 3-dimensional planning layouts permits the cost to be spread over the actual planning cycle. Price list separates complete layout system into its various components, prices each group separately and individually so that planning equipment may be selected according to budget or model. List is available on letterhead request.

"Visual" Plant Layouts Inc, Penna Ave & River, Dept SL, Oakmont (Alleg Co), Pa


This detailed line drawing of the new, patented Veelos TD and TE v-belt makes it easy to see how this new v-belt is designed to do a better job . . . easier!
Link is beveled for extreme flexibility.
T-screw is made for strength and for easy coupling and uncoupling.
Cup-washer is shaped to resist belt wear.
Stud is anchored permanently in the link for added durability.
Individual link is designed for greater strength.



New VEELOS

TD and TE Adjustable V-belt

So easy to couple *it installs in minutes*

So strong and durable *it lasts for years*

The new Veelos TD and TE adjustable v-belt is the successful development of a specific v-belt designed for a specific service—D and E drives.

This new Veelos TD and TE v-belt has these basic advantages . . .

It simplifies installation. Links are quickly joined by easy-to-use cup-washers and T-screws to make up individual belts. It's the easiest v-belt to couple and uncouple ever developed. And you don't need to waste time removing outboard bearings.

It lasts longer—is more flexible. New high-tensile strength link combined with new stud, cup-washer, and T-screw gives added durability. New link construction provides maximum flexibility for cooler, wear-resistant running.

Get the complete story of this great new v-belt for D and E drives. Send coupon now for new 8-page illustrated catalog.

VEELOS
THE LINK
V-BELT

Veelos is known as Veelink outside the United States.

MANHEIM MANUFACTURING & BELTING CO.
601 Manbel St., Manheim, Pa.

Please send copy of your new Veelos TD and TE v-belt catalog.

Name .....

Company .....

Address .....

.....

207

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Years of Preaching Experience

Standard Barrel Finishing Machine Now Offers Deluxe Features

A low-cost, standard-model barrel finishing machine with many features of the deluxe models has been added to the Honite line. Called the VS model, machine has all moving parts enclosed.

Safety features include pivot-mounted gate which closes when machine is in operation, and a magnetic brake. All lubrication points are accessible, since the motor, speed reducer, speed changer, and brake are mounted in single unit at rear. The cylinder can be removed without disassembling the machine.

This VS model has a steel frame with oversize pillow blocks and self-aligning bearings capable of carrying full loads of steel burnishing media. In addition there is a large amount of space underneath the barrel to facilitate rapid unloading. All controls are front-mounted at working height.

Unit is available in three power ranges with 1½-hp motor for ordinary requirements; 2-hp motor for heavy duty, or 3-hp motor for extra-heavy finishing jobs.

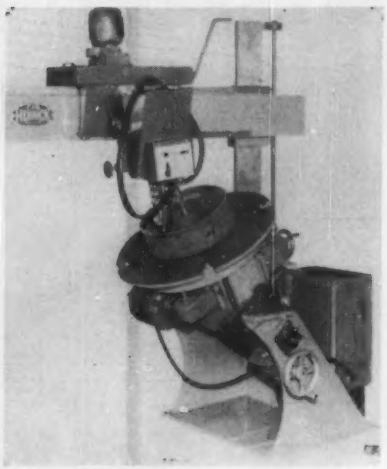
Minnesota Mining and Manufacturing Co, Dept A5-66, 900 Fauquier St, St Paul 6, Minn

Overhead Trolley Conveyor Improved By Rapistan

An improved line of overhead trolley conveyors marketed as Rapistan Keystone 228 was designed for medium duty use, is pre-fitted and match-marked at factory. From standard components of I-beam track, drive and take-up units, trolleys and drive chain, systems can be made to fit all types of operations. Speed of travel can be timed.

The 228 is an open-track unit with all parts completely accessible. The conveyor can be looped back and forth and suspended above work areas to make use of otherwise inaccessible spaces.

Rapistan-Keystone, Inc, 21750 W Eight Mile Rd, Detroit 19, Mich



Work and Head Positioner For Automatic Welding

Mast-Ram-Positioner, Model CB MRP, has been developed for positioning both the weldment and automatic welding head.

Work may be positioned or rotated under the head, which is adjustable vertically and horizontally. Motorized, variable speed, lateral travel on the ram is available with the head mounted on a travel carriage. The 360° rotation of mast and ram permits head to be swung around to work on another positioner, turning rolls, bench or floor job.

Unit illustrated is rated at 500-lb capacity; additional sizes are available. Over-all height is 78 in., carriage travel is 3 ft.

C B Herrick Manufacturing Corp, 2000 Center St, Cleveland, Ohio

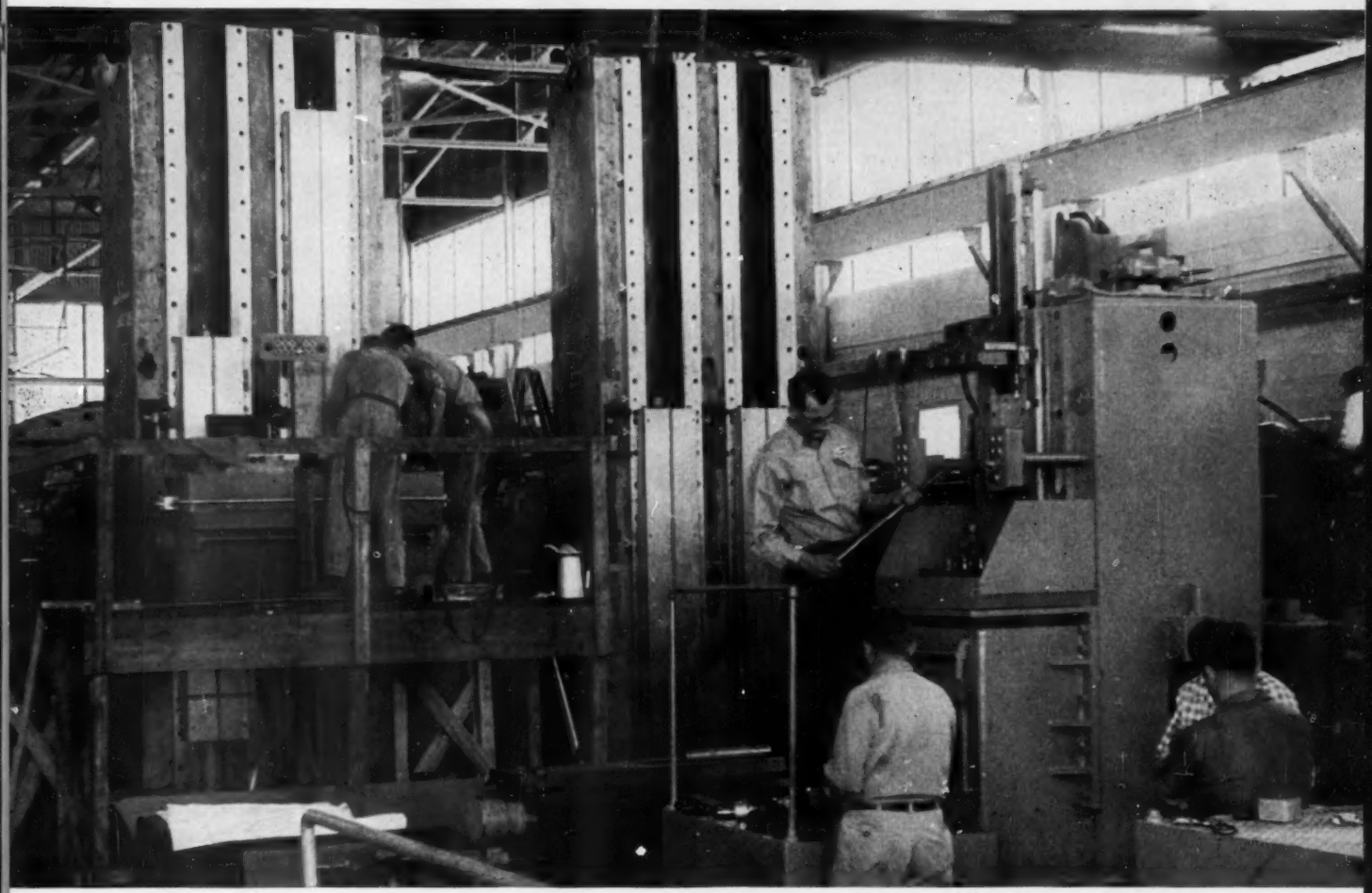
Materials Handling System For Mass Production Plants

Type WK29A, covering current range Materials handling system, designated Flow-mation, consists basically of a box with a guillotine door, and a portable hopper stand. When fork lift operator places box on the stand it automatically lifts the door, discharging the contents into a large capacity hopper, set at the right work level.

Line ranges from roll-over, bottom dumps, and funnel boxes, to large maintenance work, tack welding at of 25 to 295 amp, is designed for double-sized hoppers.

The Powell Pressed Steel Co, Hubbard, Ohio

Years of Broaching Experience



Now Applied to Building THE FINEST IN BROACHING MACHINES

Detroit Broach is in the machine tool business!

It was a logical step for Detroit Broach to move into this activity. Here is a company that is known throughout the world as a pioneer and leader in the design and manufacture of broach tooling. The engineering abilities that have built this reputation, and the knowledge gained through the application of the tooling to machines of every make and model, are reflected in these new machines which are already demonstrating exceptional production efficiency in broaching. Incorporating proven features—such as Oilgear hydraulic equipment—with many advanced design ideas, they are establishing new standards in the broaching machine field.

Today, Detroit Broach offers you the "complete package" in broaching . . . from a single broach to a completely tooled machine . . . produced to meet *exactly* every requirement for accurate, trouble-free performance.

4081

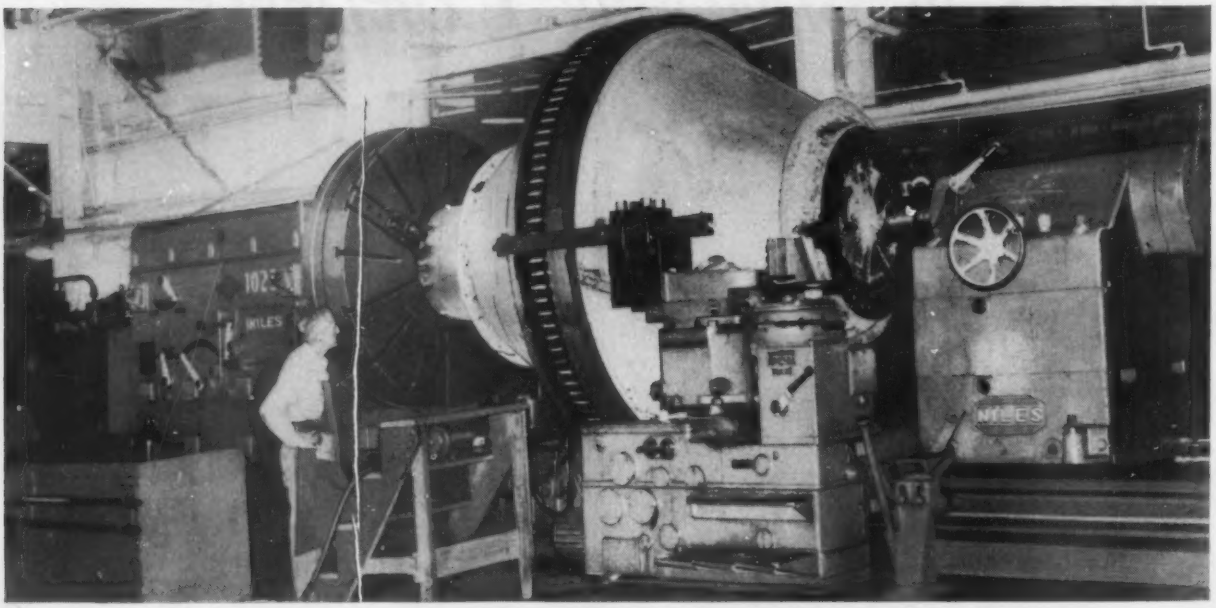
WHATEVER YOU
NEED IN BROACHING
DETROIT BROACH
CAN SUPPLY IT

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

ANOTHER EXAMPLE of
REDUCING COSTS WITH—



Ninety-Inch Niles Lathe Fitted With Raising Blocks

This 90-in. Niles lathe in The Maryland Drydock Co's marine repair shop is equipped with factory-built and fitted raising blocks. Placed under the carriage compound and head and tailstocks, the blocks increase lathe swing 30 in. and provide versatility of two machine tools with decided savings in investment and space. Bottom section of headstock and center section of tailstock are the raising blocks.

Designed and built by Niles Tool Div, Baldwin-Lima-Hamilton, the lathe also features a removable filler slide plate in the carriage bridge. By using the raising blocks and removing the carriage bridge filler, lathe can be made to machine any job up to 8 ft in dia and 45 ft long. Another attachment used to save time in tool adjustment, and eliminate inaccuracies, is the cross-feed turning bar. It is designed and fitted for bolting directly to the tool rest, and forms a solid extension for the tool. With a turning bar in place, operator can machine the closely confined space of the main journals with only two tool settings. The bar's rigid tool support assures ability to maintain accuracy tolerance well within ± 0.002 in.

The Niles lathe has a direct current motor giving four ranges of faceplate speeds: 0.415 to 1.25 rpm; 1.33 to 3.99; 4.25 to 12.75; and 13.55 to 40.7 rpm. The driving motor receives its power from a dc motor-generator set.

Niles Tool Div, Baldwin-Lima-Hamilton Corp, Hamilton, Ohio

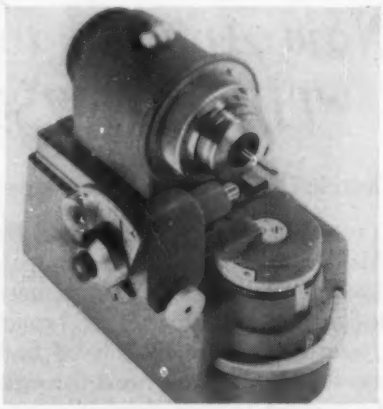
Tapping Attachment

The Tapmatic 300 tapping attachment operates on the SPV "weightless tapping" principle—does not require spindle pressure by machine operator during tapping operation. Axial floating action reportedly assures uniform tapped holes. Unit has a 1¾-in.-max diameter and 3¾-in. over-all length. The reversing mechanism permits instantaneous reversal of tap at any time through the use of New Departure angular contact ball bearing with balls serving same function as planetary gear. Attachment also incorporates Jacobs Rubber-Flex tap chuck. Manufactured with No. 2 Jacobs taper, it can be furnished with either straight or Morse taper arbors. Unit has rated capacity for tapping in steel from No. 0 to No. 6.

Tapmatic Corp, 8¼ W 16th St, Costa Mesa, Calif

Aircon basic barrel vapor degreasers are available in two types, the straight vapor model, and a heavy-duty spray unit for removing difficult greases. Portable units incorporating a standard 55-gal. barrel, with a drum size of 22-½ in., are electrically operated on either 110/115 v or 220/230 v ac.

Armstrong & White, Cheswick, Pa



TAP ANALYZER is reported most accurate measuring microscope to provide means for holding tap in firm position and in definite relationship to several calibrated motions of instrument. Geometric contours of taps which govern cutting efficiency and accuracy can be measured with tolerance specifications of 0.0001 in. Dimensional control and perfect fit are said to be assured — *Stocker & Yale, Inc, 377 Green St, Marblehead, Mass*

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Mills, core-drills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross!

Economy and auto*mation* are combined in this Special to form another example of the way Buhr *Economation* reduces production costs for leading manufacturers.

This 6-way dial-type hydraulic-feed Buhr Special is equipped with a 72″-diameter 8-position automatic index table, complete with shot bolt.

Chip disposal is accomplished by an automatic rotating chip conveyor, attached to index.

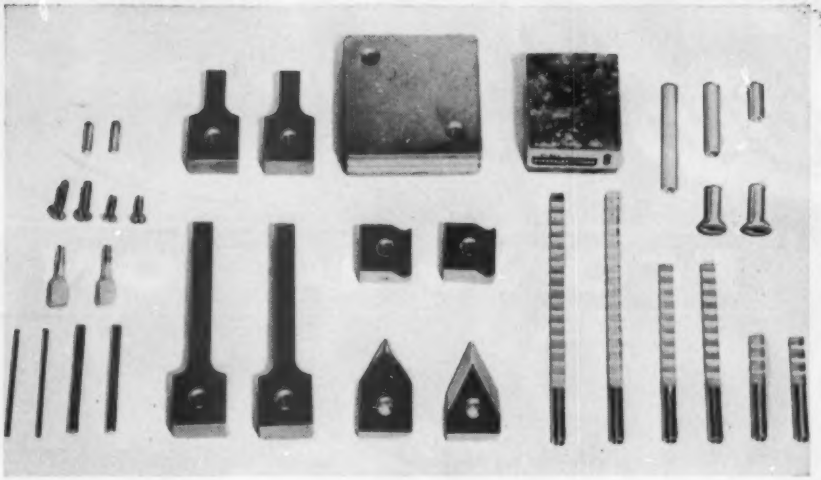
Operations formerly accomplished by eight machines were combined in this Buhr Special —and volume of production was increased! . . . A typical example of Buhr Economation!

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.©
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers



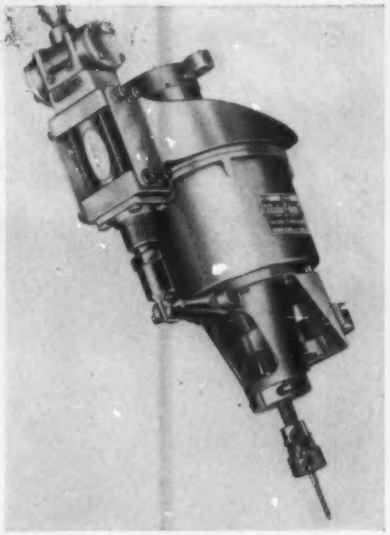
Square Gage Blocks Have Been Added to DoAll Line

DoAll has added square gage blocks to its extensive line of gaging equipment which includes rectangular gage blocks and Micro-Step gaging system. They have developed a new system of square block accessories designed to extend the use of square gage blocks in practical everyday inspection tasks.

The new system features innovations which provide for: greater ease of assembling square blocks into working gages; assembly of a greater variety of gages; and indicating-gage assemblies. Tie rods for assembling stacks of blocks interlock at ¼-in. increments by means of ratchet teeth milled on the rods. To secure mounting of vertical gages, a 2½-in. square-base block is provided with two mounting holes in opposite corners. Surface area is large enough to accommodate as many as four gage assemblies. DoAll gaging members include: flat caliper jaws with 1 and 3-in. extensions; round caliper pins for checking inside diameters (0.1 and 0.2 in.) held in assembly with specially designed Vee blocks. Scriber and center point are also part of accessory system.

Illustrated above is the accessory set for assembling indicating square block gages. Special drilled and tapped gage blocks accommodate brackets for holding dial indicators in several positions. The special gage blocks provide a fast, a simple method for precalibrating a dial indicator before it is aassembled into gage.

DoAll Co, Des Plaines, Ill

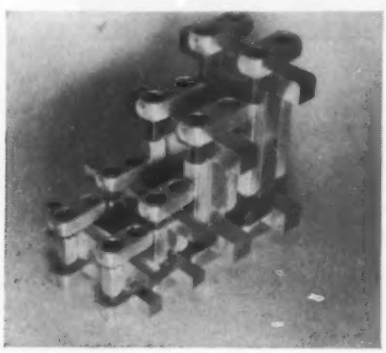


Leadscrew Tapping Head

New auto-tap heads allow fully automatic or semi-automatic leadscrew tapping on any drill press. Tapping heads use standard Bellows air motors and Electroaire valves for activating clutch mechanism. Although a fixed return micro-switch impulse completes the cycle, starting impulse can be arranged to suit needs.

Two models are available for tapping sizes No. 0 to 5/16 in. (Model 800) and No. 10 to ¾ in. (Model 900.)

Automatic Methods Inc, 965 W Grand St, Div 9A, Elizabeth, NJ



Built-Up Snap Gage

The convertible built-up snap gage is intended to save gage makers time in plants which find it necessary to make their own built-up snap gages. It contains two HSS hardened-and-ground anvils and spacer block which is finished to minimum figure to be gaged. Three parts are held together with bridges, side bars, and socket head cap screws. The fact that anvils are solid bars and free to move in assembly allows numerous varied positions of the anvils. Gage is built in four sizes covering a range of 0 to 1.968 in. The use of the four sizes establishes a system which lends to the interchangeability of the anvils, bridges, and other parts.

Mechanical Products Co, 30 Manhan St, Waterbury, Conn

Air stock feed and collet operating unit automatically feeds bar, hex, or tubing stock to a machine. Can feed stock for any mechanism, rotating, or non-rotating, and is designed to operate with any type of collet equipment. Takes stock up to 2-⅝ in.-dia; feed length is adjustable from 0 to 15 in.

Erickson Tool Co, E 23rd & Hamilton, Cleveland 14, Ohio

Relco Spiral Surface Mill Has Carbide Cutting Surfaces

Five-fluted tool, designed for nonferrous metals and plastics, is said to remove far more material with fewer passes than conventional surface mills, and to give superior finish.

Carbide-tipped cutting surfaces of the 9-in.-long unit are curved to 20° spiral so that each runs two-thirds around the tool. Design gives a multiple, angular, continuous cutting action, in which successive cuts by each edge overlap to distribute cutting load evenly over surface.

Relco Carbide Tool Co, Box 124 Elmwood Station, Providence, RI

Photo courtesy The Alliance Drop Forging Co.

●Youngstown Hot Rolled Alloy Bars assure uniform response in our customers operations because such uniformity starts at the Ore Mines. At every operation, in Youngstown's completely integrated steel manufacturing facilities, rigid quality controls make certain that uniform chemistry, physical properties and dimensions are furnished.

SPECIFY

Youngstown

Hot Rolled QUALITY YOUNGSTOWN SERVICE Alloy Bars

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

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9 TIMES MORE PAINT MILEAGE ON AUTOMOBILE CHASSIS!
STUDEBAKER
gets a better, more uniform, paint job on chassis as production is increased and finishing costs are cut substantially with
RANSBURG NO. 2 PROCESS Electrostatic Spray Painting*

● When Studebaker Division, Studebaker-Packard Corporation switched to Ransburg No. 2 Process of Electrostatic Spray painting on their automobile chassis, paint mileage was increased 9 times.

By simply putting the paint where it's supposed to go, Studebaker cut daily paint consumption on the chassis production line from 14½ drums to 1½ drums. And, still they are painting 6 more chassis per hour with the No. 2 Process.

In addition to getting better, more uniform coverage with the asphalt-type coating, paint and labor costs were cut 70¢ per chassis. In eliminating the former set-up with 2 water wash booths and 12 automatic spray guns, they save nearly 1000 square feet of badly needed floor space.

Another on-the-job-example of the unmatched efficiency of the Ransburg No. 2 Process in which quality of the work is improved . . . AT LESS COST!

*Studebaker also uses the Ransburg method to apply a heavier and more uniform primer surfacer on automobile bodies.

Whatever your product—large or small—if your production justifies conveyorized painting, it's possible that one of the Ransburg electrostatic processes can do the job better, with substantial savings to you. We'll be glad to tell you about complete Ransburg services.

Write to Dept. A.M.

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana

RANSBURG

ROUND TABLE Discussion

SPOT DEMOTION

Should the foreman explain to a worker his reasons for shifting him from one machine or job to another? Will such an explanation eliminate misunderstanding and resentment, or is it unnecessary?

I BELIEVE that Ed has the wrong attitude for a foreman. He has taken a very narrow-minded, short-sighted viewpoint. He cannot possibly make good decisions on this or other problems because it is evident that he just does not know how to approach and solve a problem.

To make a good decision in any situation it is necessary to have a clear understanding of the problem at hand and a knowledge of the ultimate objectives. Ed knows what the problem is because it keeps coming back to him, but he has lost sight of the ultimate objective. He has been hired by management as its representative in the shop and he should make its objectives his objectives. Management is in business to show a profit and not to inflate its ego by lording it over employees in a dictatorial manner.

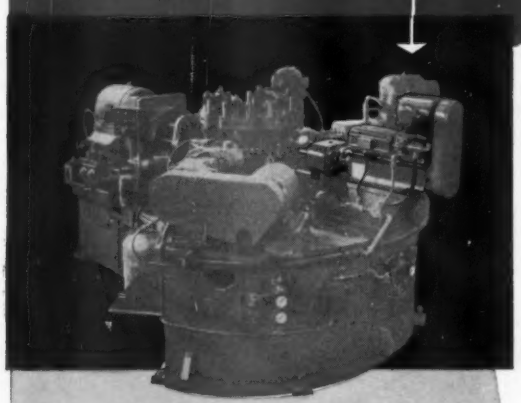
Supervision involves an intelligent overseeing of the activities of the workers to make sure that the work is carried out efficiently and in line with the policies of the company. The good foreman is not a driver who is behind the men pushing them. He is a leader and by the very meaning of the term he must be

"He's smarter than he looks, chief, but then he'd have to be."

New MORRIS AIR·OIL·MATIC DRILL UNITS

air power • hydraulic control or all-hydraulic models

Unit Type Six-station automatic indexing machine for drilling, tapping and facing a master brake cylinder. The Air-Oil-Matic unit shown drills two .026" diameter holes at 10,000 R.P.M. in cast iron.



perfected to give exceptional versatility for higher production at lowest cost

Here's the automatic drilling unit you've been looking for! The Morris AIR-OIL-MATIC Drill Unit is a powerful package of precise versatility developed and perfected by one of the nation's leading manufacturers of high production drilling machinery. Now, this compact unit (air or oil powered and hydraulically controlled) is available for your use in special purpose machines.

Designed for a wide range of drilling, reaming, chamfering, spot facing, hollow milling, centering and related operations, it can be mounted in vertical, angular or horizontal positions. The Morris AIR-OIL-MATIC Drill Unit has adjustable feed rate, feed stroke, total stroke. Controls and actuating devices can be set to provide almost any desired sequence of operations. (see condensed specifications)

If you have mass production operations involving drilling or related operations . . . you'll want to know all about the Morris AIR-OIL-MATIC Drill Unit. New literature describing the unit, its advantages and applications and complete with specifications, is available on request.

CONDENSED SPECIFICATIONS

Length, width, height	33¼" x 11" x 23"
Maximum HP at 1800 rpm	2 HP
Spindle speeds	133-6900 (Standard) (Special speeds on request)
App. maximum thrust	650 lb.
Maximum drill size	⅝"
Maximum stroke	6"
Maximum feed stroke	4½"
Feed rate range	0 to 48"/min.
Quick approach rate	480"/min.
Quick return rate	300"/min.

Morris MACHINE TOOL COMPANY

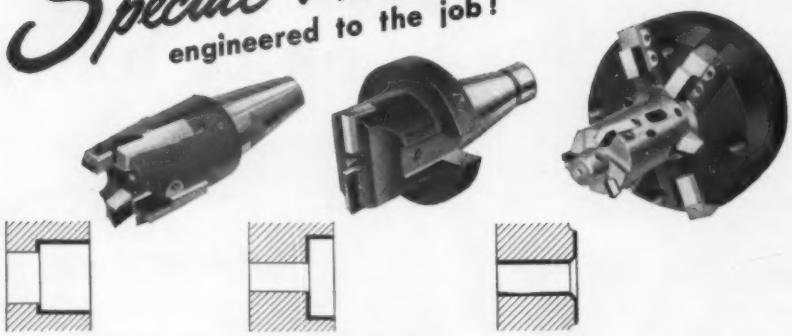
933 Harriet St., Cincinnati 3, Ohio

Cullman MOR-SPEED Line

McCROSKY

COST CUTTING TOOLS

Special Production Tools
engineered to the job!



Combine Related Boring, Counter-Boring, Facing, and Chamfering Operations Into Just One Tool

PRODUCE BETTER WORK FASTER and at LOWER COST

● How can you keep competitive if you do four operations, when your competitor does only one?

Cut your costs and increase your output with McCrosky's "Multiple Operation" specials. Engineered specially to your individual work conditions, a McCrosky Special combines 3, 4, 5 or more related operations — does them all simultaneously with one tool — and one set-up — assuring unvarying uniformity of finished product — eliminating repeated handling — reducing the amount of work in process — speeding up deliveries and producing other economies so great that they pay their way even on moderately short runs.

Write for Bulletin No. S-18. It can really save you money!

COST CUTTING TOOLS **McCROSKY TOOL CORPORATION**
MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

Jack-Lock® **MILLING CUTTERS**
Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Cutters. Sizes to 24" in dia.

Super®-Adjustable **REAMERS**
Chucking and shell designs. Proven construction locks blades rigidly, producing smooth, concentric holes.

Special **PRODUCTION TOOLS**
Combine 2 or more related operations into a single tool, producing better products, quicker, and cheaper.

Universal **MILLING CUTTERS**
Bodies can rotate in either direction. Simply using blades of proper hand, angle and cutting material, meets any requirement.

ask us about...

Wizard® **QUICK CHANGE CHUCKS**
Tools are held centered and rigid. Operator can change tools without stopping or slowing down the spindle, increasing production and cutting costs.

Turret **TOOL POSTS**
Successive tools are swung into cutting position quickly, indexed accurately and locked rigidly, giving engine lathes the versatility of turret lathes. 5 styles, 9 sizes.

Block Type **BORING BARS**
Bore more pieces in shorter time, with greater accuracy. Stock sizes with straight or tapered shanks, with or without pilots, for holes up to 15" in dia.

out in front bringing the men along after him by appeal to the motives which he knows make for cooperation and desire to follow.

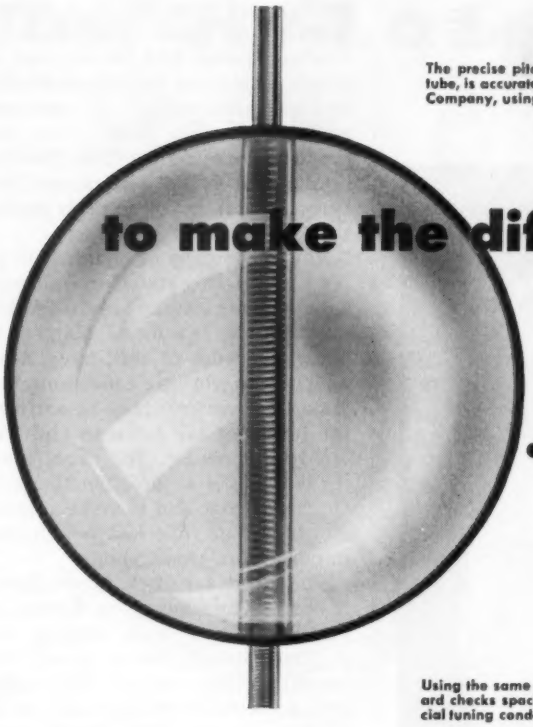
Not all men can employ the same tactics, nor will all workers respond to the same treatment in the same way. However, there are certain general techniques which the leader will do well to consider. Tact is, after all, merely an intelligent and thoughtful consideration of the feelings of the other fellow. Intelligent consideration is not pampering and is not an indication of weakness.

To those working under him the foreman owes real leadership and a fair deal, courtesy, understanding, and consideration. He owes the company a fair and impartial interpretation of rules and policies in his contact with the workers. No one wants to be merely a gear in a machine. The foreman should explain just why he is shifting a man from one machine to another. It will give the man a feeling of participation in the organization, no matter how big it is, and thereby raise the worker's self-esteem. A man is entitled to know why the work he is doing is important, where it enters into the general scheme of things, and how it affects the products that the plant is turning out.

H G Koslow
Bronx, NY

ONE SOMETIMES WONDERS if we are just getting soft or do we now just look for trouble in labor. Naturally the times have changed and we find ourselves in the midst of technical conditions when dealing with workers or even with the foremen themselves. It is not uncommon for workers to get teed off at being changed from one machine to another. It is

"Good news, Higgins! We've decided to put you in charge of the plant."



The precise pitch of this wire helix, in its glass tube, is accurately measured by Hewlett-Packard Company, using a Kodak Contour Projector.

to make the difficult easy

...the easy economical

Using the same contour projector, Hewlett-Packard checks spacing and parallelism of this special tuning condenser.

Hewlett-Packard relies on the Kodak Contour Projector

Here is an on-the-job demonstration of how projection gaging can solve difficult problems in inspection, slash costs in checking parts to close tolerances.

Using a Kodak Contour Projector, Hewlett-Packard Company measures the pitch of a precision wire helix for a unique electronic tube. Surface and shadow illumination provide a 20× enlarged image of the minute and delicate part. "Without the Kodak Contour Projector," say Hewlett-Packard officials, "it would not be practical to make the measurements necessary to get a satisfactory instrument."

Using the same contour projector, Hewlett-Packard also checks spacing and parallelism of a special tuning condenser for electronic test equipment. Conventional shadow projection provides a 10× enlarged image of the leaves. "Use of the projector," the company reports, "permits economical measurements of parallelism to an accuracy impossible to obtain by other methods."

Diverse jobs like this are easily done with a Kodak Contour Projector. A twist of a dial provides whatever magnification is needed. A flick of a switch brings surface illumination to supplement shadow projection. Easy to see, isn't it, how a Kodak Contour Projector quickly pays for itself in use.

For more information on how you can use projection gaging in your own work, send for a free copy of "Kodak Contour Projectors."

EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
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ACCO products

Wilson "Rockwell"* Hardness Testers

Ohmite uses WILSON "Rockwell"* equipment to help maintain quality

A FULL LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

FULLY AUTOMATIC
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REGULAR
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TUKON MICRO & MACRO

• Quality of materials is vital in the manufacture of precision products. Ohmite Manufacturing Company, nationally-known makers of rheostats, resistors and tap switches, starts manufacture by making sure of exactly the right materials. Incoming metals are tested on a WILSON "Rockwell" hardness tester. These tests not only assure use of only quality metals but also help eliminate waste. Metals unsuitable for certain types of parts have sufficient hardness for other uses.

The Ohmite Mfg. Company uses a wide variety of anvils and scales to test hardness of incoming shipments. Carbon steel, cold rolled steel, brass, and phosphor bronze are tested both as strip and small parts.

There is a WILSON "ROCKWELL" Hardness Tester to meet every requirement, including the WILSON Tukon for micro-indentation testing. Write for literature and prices.

*Trade Mark Registered

ACCO

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

KRALL DIAMOND PENETRATORS AND ACCESSORIES

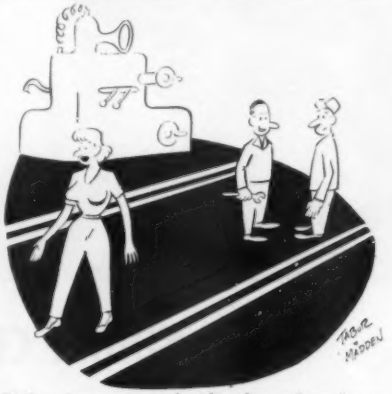
because we have set up a more or less uniform production line in our machine shops and throughout our plants. This tends to make specialists, and specialists are always more temperamental than others who have broader backgrounds. They feel that no one can do the job except themselves, and in many respects perhaps they are right.

Now if company or department policy is not clearly stated, trouble arises when men or women are shifted from machine to machine. Many companies, because of this, have clearly defined the working conditions. They state that workers may be shifted at the desire of the foreman and without specific cause. The usual reason for shifting is to broaden the worker's knowledge and to make a flexible working staff. The last is extremely important in small shops.

The need for such diversification is obvious and merits no further discussion. Where such policies have not been established it is well for a closer co-ordination between foreman and worker. More explanations are needed in order that all will understand the working conditions.

When new employees join the department it is necessary and imperative that they be told that sooner or later they will be moved around. This is in keeping with the view that everyone has a spot where he or she is best fitted and in the rotation of workers this spot can be found. Furthermore, it broadens the worker as well as building a flexible team of employees, which means reduction in costs of operation.

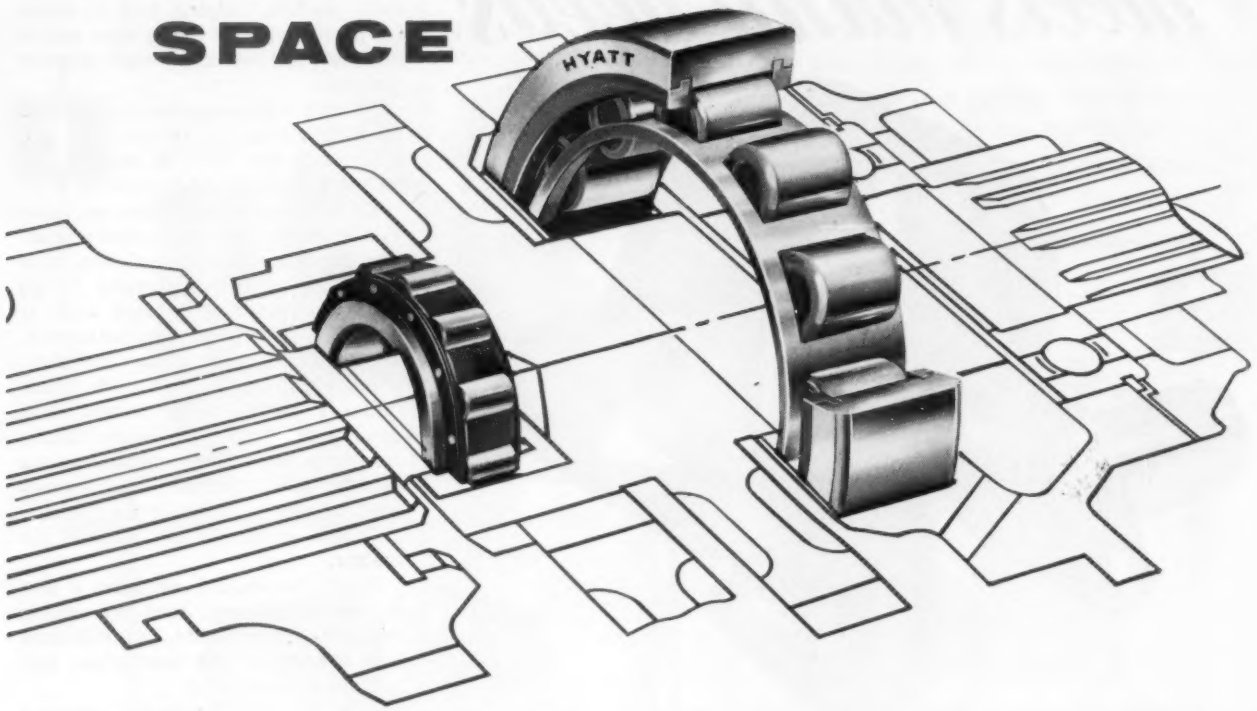
It would appear that Ed had failed to establish a policy which he followed and that the policy—if any—was not clearly understood by his employees. Perhaps he had no policy except when he wanted one. This may be very convenient for Ed, but troublesome for the company and its employees. One thing that foremen must realize is that they must



"Miss Jones stays inside the safety lanes, says it isn't safe for a girl outside of them. Too many wolves down here."

How Hy-Loads can help you

...SAVE SPACE



HY POTENUSE, the sage of the slide rule, SAYS:

your COMPLETE LINE of cylindrical roller bearings

Here's a tractor transmission where the designer's done a mighty fine job of cramming the whole works into a housing with dimensions tighter than McTavish's purse strings!

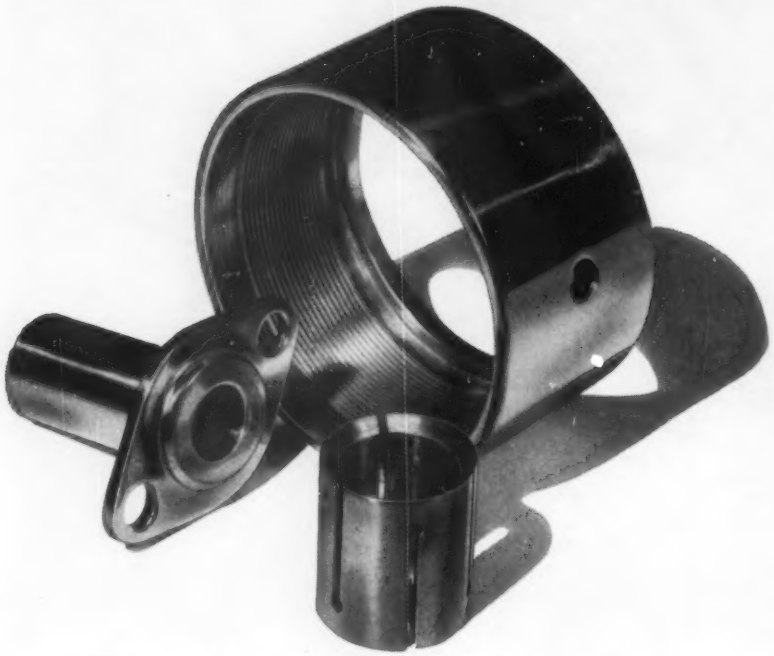
See how he did it? He used a HYATT BU-type Cylindrical Roller Bearing at the pilot position with the *outer race omitted.* Then on the input shaft he used a HYATT TS-type bearing with the *inner race omitted.* Gear-box size is held to a minimum with maximum bearing capacity! Hyatt makes 4 types of Hy-Loads with separable inner races and 2 types with separable outer races. And brother, they sure come in handy when you're cramped for space! If you haven't a HYATT General Catalog No. 155 handy, better send for yours right now. It'll help you find the answer to lots of pesky problems. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

THE LOW COST BEARING THAT...

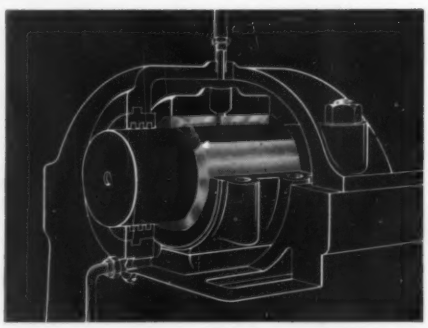
meets many needs



Cast Bronze Bunting Bearings can be supplied in many forms from the simplest to the most intricate. They offer many ways to cut the cost of both design and production without any sacrifice of performance or durability.

It may save you much expense and trouble to find out what Bunting Bronze Bearings can do for you. There is a Bunting engineer near you for consultation. Or write our Product Engineering Department at Toledo.

The Bunting Bearing offers ways to reduce the cost of a design and to employ designs that provide more economical production as well as lower initial cost.



Bunting.

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

THE BUNTING BRASS & BRONZE COMPANY, TOLEDO 1, OHIO
BRANCHES IN PRINCIPAL CITIES • DISTRIBUTORS EVERYWHERE

play the game of foremanship on the level. They have to use all the workers alike and show no favoritism if they are to be successful.

Either be hard-boiled and take the loss of men, if it comes, without crying, or be fair and work with each worker, helping him to solve his problems and build a team which will respect you and want to work for you.

No half-way measures, no "We will do it this way for Johnny and this other way for Bill." It doesn't pay off—it never did and it never will.

Ed, not having made any explanation to Browning, has created a problem for himself. The solution now would be to call Browning in, go over the past and explain what is expected of him in the teamwork. If Browning has made mistakes, point them out—don't hide them under a barrel to be waved as a dead herring some day in the future. Do things when they happen, not six months later. A minor situation may well become a crisis if no decision is made promptly to handle the matter.

In the future, Ed, establish a policy of telling your men the reason why changes are made. You will have less headaches and heartaches and get more production.

Charles D Townsend
West Hartford, Conn

THERE ARE MANY WORKMEN in any large machine shop who are of the strong opinion that they can run the shop much better than their foreman. Some of these men become chronic on the subject and waste a lot of time telling others how

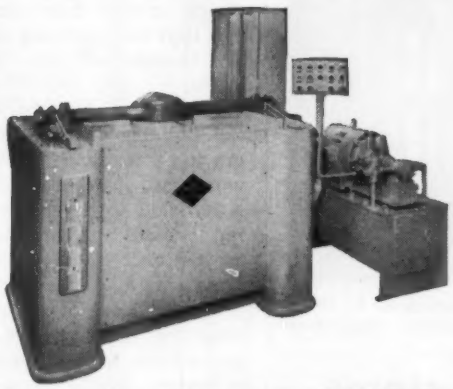
"Just how many years has it been since we cleaned out these files?"

New IMPCO "Automated" Machinery

SPEEDS Automatic DRILLING, CHAMFERING, COUNTER-BORING, BURRING, and POLISHING

Are your faced with production problems requiring special machinery? Here are 3 *profitable* IMPCO solutions to specific production problems

1



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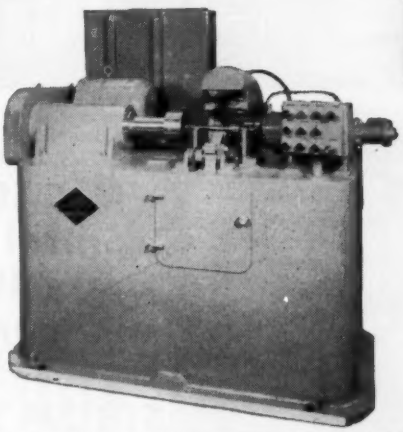

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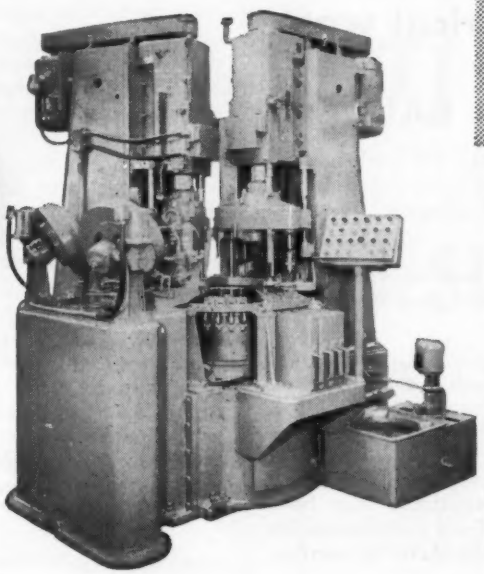


1 IMPCO Backchamfering Machine

Backchamfers 10 carrier bolt holes on inner back flange face of automobile rear axle housing at the rate of 280 PCS PER HR.

Axle housing is transferred to the machining station, backchamfering tools automatically swivel in position to chamfer the holes, retract and return to starting position. Part unloads automatically.

2 IMPCO Polishing and Wire-Brushing Machine

Automatically polishes bearing diameter, deburrs shoulder, and automatically wire brushes oil grooves of automobile transmission shaft at rate of 720 PCS PER HR.

Completely automatic. Spindle runs *continuously*. Abrasive cloth automatically indexes for each operation.

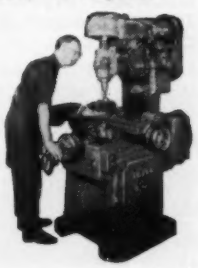
3 IMPCO Automatic Drilling Machine

Loads, drills, counter-bores and burrs automobile valve-lifter parts at rate of 2800 PCS PER HOUR to a tolerance of .0015". Hydraulically indexed table. Machine cycle entirely automatic, or hand-controlled, as required.

IMPCO

Find out how IMPCO engineers can serve you. WRITE TODAY.

IMPCO Model 1-B Vertical Mill



INDUSTRIAL METAL PRODUCTS CORPORATION

Builders of IMPCO Straighteners, the American HEB Pilot Lathe, and Special Machinery

3400 W. ST. JOSEPH STREET **LANSING, MICHIGAN**

McCaskey Inventory Control of finished stock.

McCaskey Control of Work-In-Process used by Strom Steel Ball Co., Cicero, Illinois, largest independent manufacturer of steel balls.

McCASKEY Systems control PRODUCTION and INVENTORY with minimum clerical work for STROM STEEL BALL CO.

Strom controls work-in-process and finished stock with two McCaskey installations, briefly described by Kenneth E. Swanson, Industrial Engineer.

The first gives the Production Manager ***at a glance*** all the facts he needs to control production and process inventory of hundreds of types and sizes of steel balls by size and departments. Among them are:

(a) units produced by each department against schedule;
(b) location and amount of all process inventory;
(c) sizes or departments behind schedule, requiring corrective action;
(d) bottlenecks, if any, in flow of production;
(e) inventory banks to be increased or decreased.

McCaskey Inventory Control of all material in finished goods stock replaced a machine-posted system several months ago. The Sales Department must have dependable data on units available at all times to make definite commitments for shipments from stock. McCaskey provides this accurate, ***up-to-date*** information.

McCaskey Controls quickly return their first cost in improved operations, time and effort saving. They require a minimum of clerical work.

MAIL COUPON FOR COMPLETE INFORMATION

Victor Adding Machine Co.
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street
Chicago 18, Ill.

Please send me complete facts on: McCaskey Production Control ☐; Inventory Control ☐.

Name .....
Position .....
Company .....
Address AM-4-55

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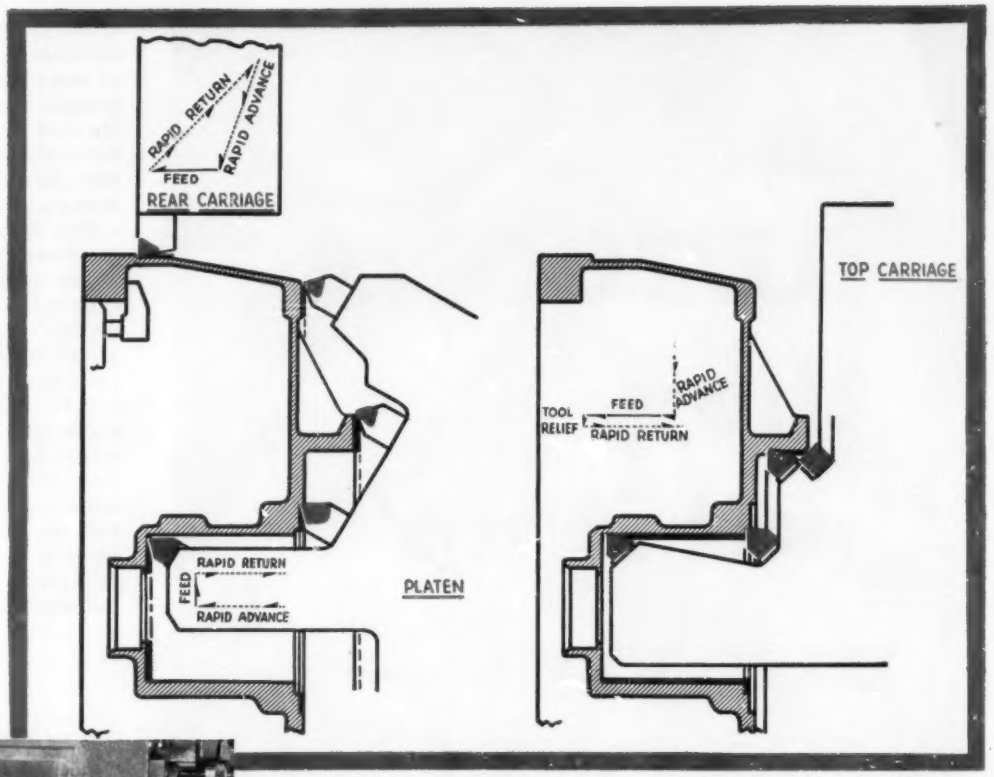
3900 N. Rockwell Street, Chicago 18, Ill.
Galt, Ontario, Canada

certain jobs should have been done and, since they are occasionally right, they do cause the foreman trouble and worry. This sort of talk also tends to make other workmen, particularly those who are not yet in the craftsmen grade, very suspicious of the foreman and think there is something tricky in any orders. Browning may have this attitude which caused him immediately to feel that he was being demoted when Ed transferred him from the jig borer.

Ed, on the other hand, apparently did not use good judgment in failing to be frank with Browning. Any workman, good, bad, or indifferent, is entitled to be told why he is being changed to another job when he has unfinished work on hand. If Browning had been told that some precision work was coming in, and since he had not yet had enough experience to be given the job, he probably would have felt better about the transfer and even may have decided with himself that he would start turning out the very best work he was capable of in the hope that he would not be passed by when any future shipment of precision work was in view. This is the spirit the foreman should strive to instill into the men under his supervision.

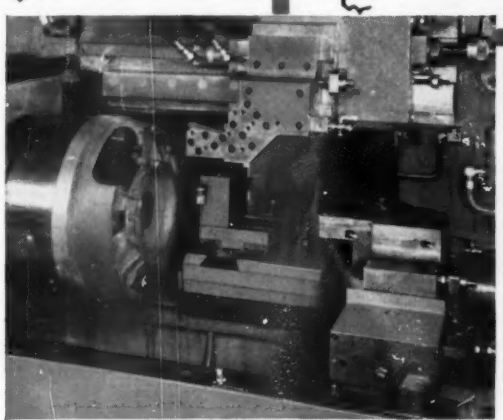
A good foreman treats his men with respect and frankness, and if they are not doing their work satisfactorily he tells them so, and suggests what they can do to correct their deficiencies. If, after this advice, they make no effort at improvement he has no other action than to either fire the man or demote him to a job he can handle. Some men can never make the grade as toolmakers; it just is not in their make-up, they do not have the feel and dexterity to meet the demands

"— — Aim me in the general direction of the door, will you, Mac?"



Tooling layout for machining magnesium alloy housing. A chamfer tool is added in top carriage for finishing operations.

Tools on top and rear carriage plus platen leave front clear for easy loading. Special finger chuck prevents distortion or interference with tools.



JET ENGINE HOUSINGS ROUGHED AND FINISHED *on* SINGLE HYDRA-FEED

Just one Model HD-24 Hydra-Feed automatic lathe roughs and finishes cast magnesium alloy jet engine housings for a major aircraft engine builder. Maximum utilization of multiple carbide tooling on top and rear carriages plus a platen leaves the front of the machine open for easy loading and unloading, permitting this high production rate.

Push-button actuation is required only for clamp, feed start and unclamp—all cutting operations are automatic. A two-speed 1800/3600 rpm motor is shifted automatically as required by the machine cycle.

During a single setup, the top carriage bores three different diameters, the rear carriage turns O.D. of the housing and the platen faces three external surfaces plus the bottom of the main bore.

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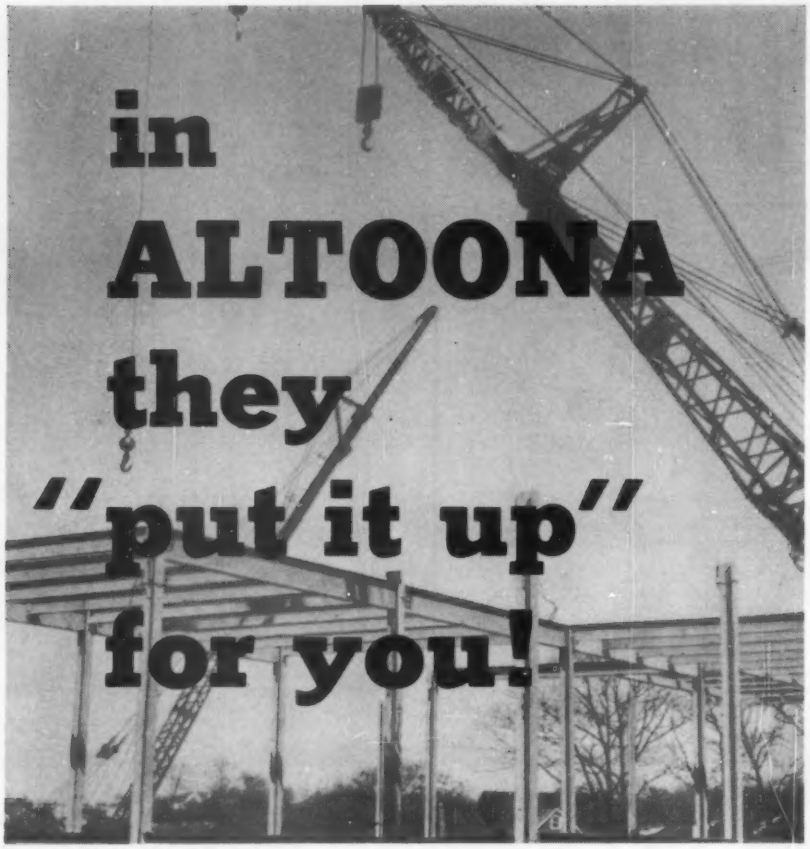
SALES AND ENGINEERING OFFICE, 730 W. EIGHT MILE ROAD, FERNDALE, MICHIGAN



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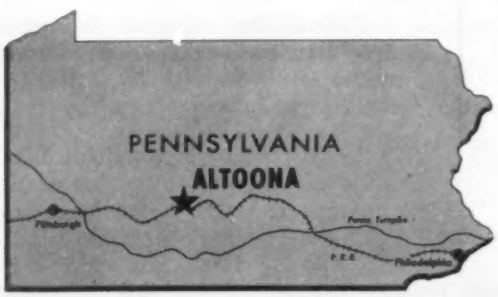


Write Dept. AM-4 or phone ALtoona 3-8151 in confidence

ALTOONA Chamber of Commerce
Altoona, Pennsylvania

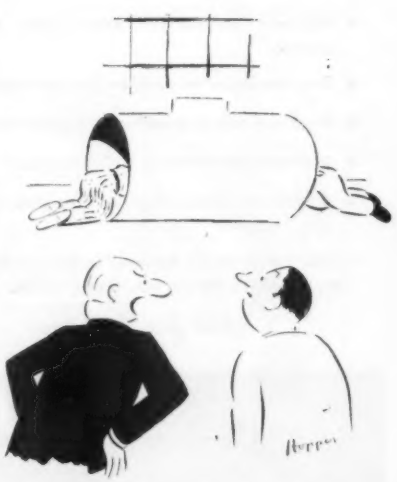
of the job, but sometimes they prove valuable at the rapid production of work that is of a less exacting nature. The foreman who can place his men on work for which each is best adapted is not only a very valuable foreman, but his entire crew is in a position to earn better wages.

Yes, Ed is being bull-headed and rough-shod when he takes a man off an unfinished job without any explanation other than "Because I say so," and he is doing nothing at all toward building up a smooth-running and efficient organization. If a man is good, then tell him so, if indifferent, then warn him and tell him to try harder to make the grade; if consistently bad, then fire him and tell him that in spite of all warnings and help he still has made no serious effort at improving himself and thus has lost his chance to become one of the craftsmen in his section.

George P Pearce
Albuquerque, NM

BROWNING HAS EVERY RIGHT to be peeved if Ed demoted him in the way that seems to be the case. Ed would be sore as a pup if anyone had taken him from a good job and put him at another of a lower grade, without any explanation. There may have been a perfectly good reason for shifting him, but he was entitled to know the reason. Of course when a man is pushed up he is apt to puff out his chest and assume that he's been making good, that the boss thinks he's OK. But to shift a man down, without telling him the reason, is a fine way to stir up a hornets' nest.

All good men, including Ed, have a sensitive spot. The better the man the more sensitive he is likely to be.



"They may be coating it like you say, but I'd swear I hear dice!"

If messing up a job was the real reason for shifting him to another job, it would have been far better to tell him so. He should have been shown just where the job went wrong. In that way he would have learned something that would have helped him and the firm on other jobs, perhaps even on other machines. To take him off a job without telling him why hurts his feelings a lot more than telling him the truth. You don't save a man's feelings by shifting him to a job that can be handled by a lower-grade man.

Of course Ed should put his men where he feels they are the most valuable to the firm. If they object to changing when there is a good reason for so doing, and they know what the reason is, they better hunt another job. But if Ed wants to get the best work for the firm he'll give the men the kind of information he would want if he was in their place.

I have known many foremen in many industries. The ones who have been most valuable to their employers have kept their men happy by handling them as we all like to be treated. Most shops have to shift men from one job to another. Most shifts may require no explanation, unless a man is over-sensitive. But when you put a man on lower-grade work it makes for better feelings all around to tell him the reasons for so doing. Even if the reason is that he hasn't made good on the better job he should be told, as kindly as possible, and suggestions made as to how he can improve.

Fred H Colvin
Point Pleasant, NJ

•

THERE IS CONSIDERABLE DIFFERENCE between moving an employee around and pushing him around. Evidently Ed was of the opinion that he was moving Browning around for the company good, while Browning got the impression Ed was pushing him around for purely personal reasons. Which inclines me to the opinion that somewhere along the line Ed didn't do a very good job of explaining why he put the man on the jig borer in the first place. I think if he had taken time to explain to Browning that he was transferring him to the jig borer because of his policy of giving each man in the shop an opportunity of acquiring experience on every machine, and further emphasized the fact that he reserved the right to take him off the machine without prejudice to his future with the company, Browning would have

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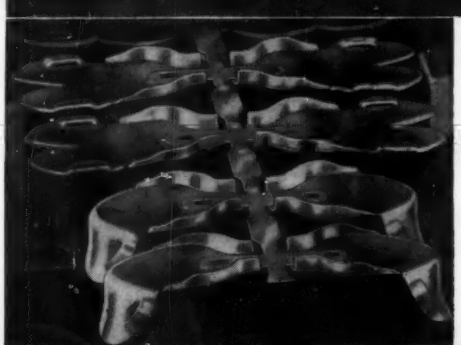

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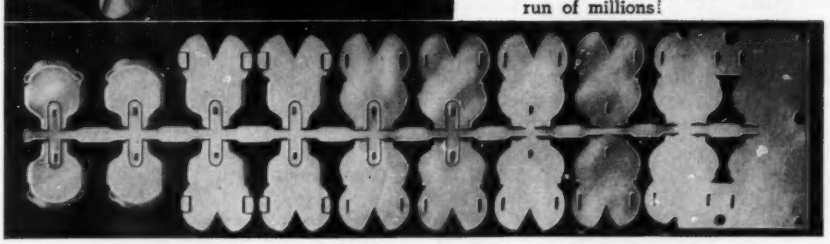

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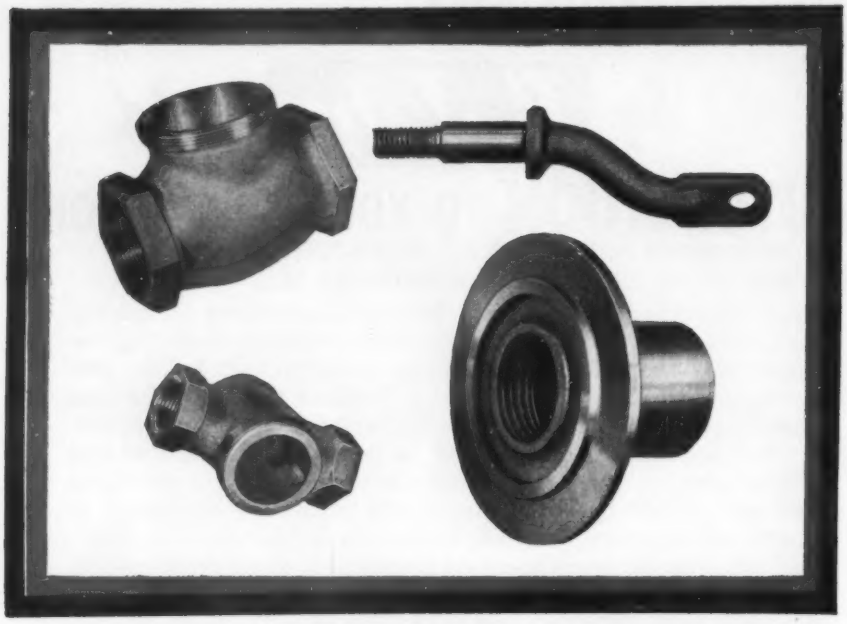

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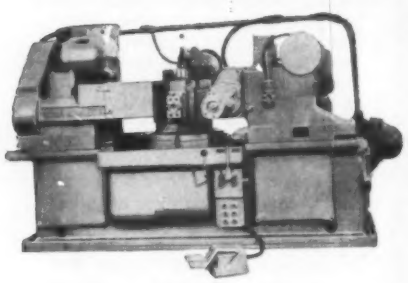

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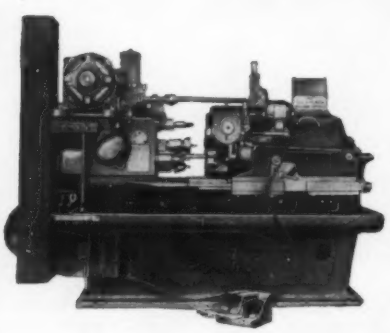

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taken his transfer to the grinder with reasonably good grace.

As matters stand, Browning feels he hasn't had a fair shake and Ed feels his authority as a foreman has been questioned indirectly through grapevine gossip. Which leaves the company in the middle, holding the bag.

I think the moral to this story is simply that Ed has the bull-of-the-woods idea that it is beneath the dignity of a foreman to take the employee into his confidence and explain why it would benefit the company more to have a more experienced employee take over the jig borer in view of the fact that some really tough jobs were coming up. In fact, it wouldn't hurt to have Browning leave the grinder for two or three hours a day and allow him to watch the more experienced operator make his setups on the jig borer. At least, it would in some measure take the edge off his feeling of disappointment and convince him that the company hadn't lost sight of the fact that he would be available when the more experienced operator wasn't around.

When all is said and done, it is a very obtuse individual who does not recognize his own limitations. Browning, for example, if properly approached, would be willing to admit that the company's interests would be better served if Harmon took over the jig borer. A little tact on Ed's part, a little less consciousness of his own "dignity" as a foreman; a little more human kindness, if you will, would have eliminated an unfortunate situation.

Robert S Alexander
Glastonbury, Conn

"Go ahead and put in for his severance pay, cost-of-living bonus, cancel his insurance, check him out with the union, take care of his vacation pay . . . on second thought, better give him another chance. It will cost too much to fire him!"

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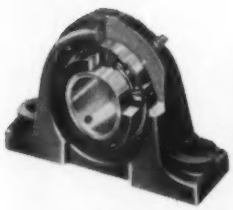

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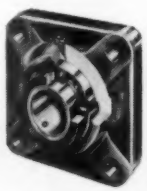

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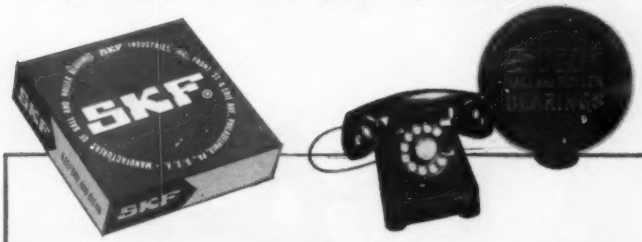

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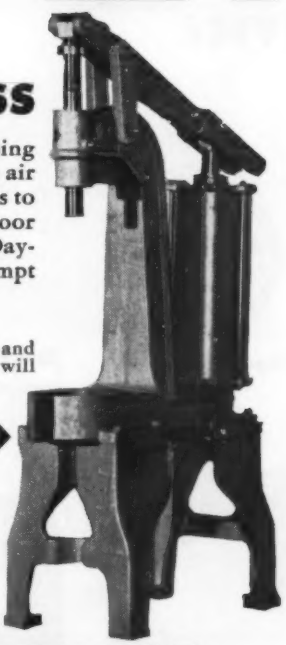

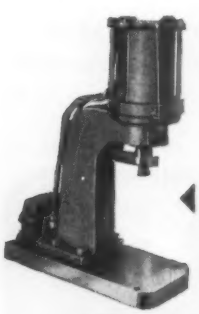

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WHIPLASH

Will the shop men tend to work harder or faster if they are aware that the foreman is making notes on their work habits? Or will they grow resentful at his apparent lack of faith in them?

IT IS USELESS and a waste of time for the supervisor to check up on the employees' apparent energy. The supervisor knows who is dogging on the job. He also knows who puts out quantity and quality production. The check-up on who works, and who talks, will cause resentment and discord in the department.

I agree there are times when we have to make use of all three methods of management: autocratic, democratic, and free-rein. The autocratic method should be used only when the other two fail. When an employee is sincere in his efforts to produce he takes it as a compliment if allowed to work free-rein. Others react favorably to the democratic method. The foreman or supervisor who uses autocratic methods is like the fellow who carries a chip on his shoulder; he always gets into a fight. The foreman may have a good time by throwing his weight around, but will others share that pleasure?

A E Salmons
Philadelphia, Pa

IT IS A WASTE OF TIME for a foreman to circulate among his men to make notes on their activity, or the lack of it. Such action does not increase productivity per man hour; it generates friction.

The foreman has a motive. He wants to maintain discipline by keeping his men on the job. He wants to increase efficiency by having the workers make proper use of their time.

The end is a good one. Without

"I keep punching the wrong number and the boss said disgustedly, 'Let me show you how,' but he missed the clock!"

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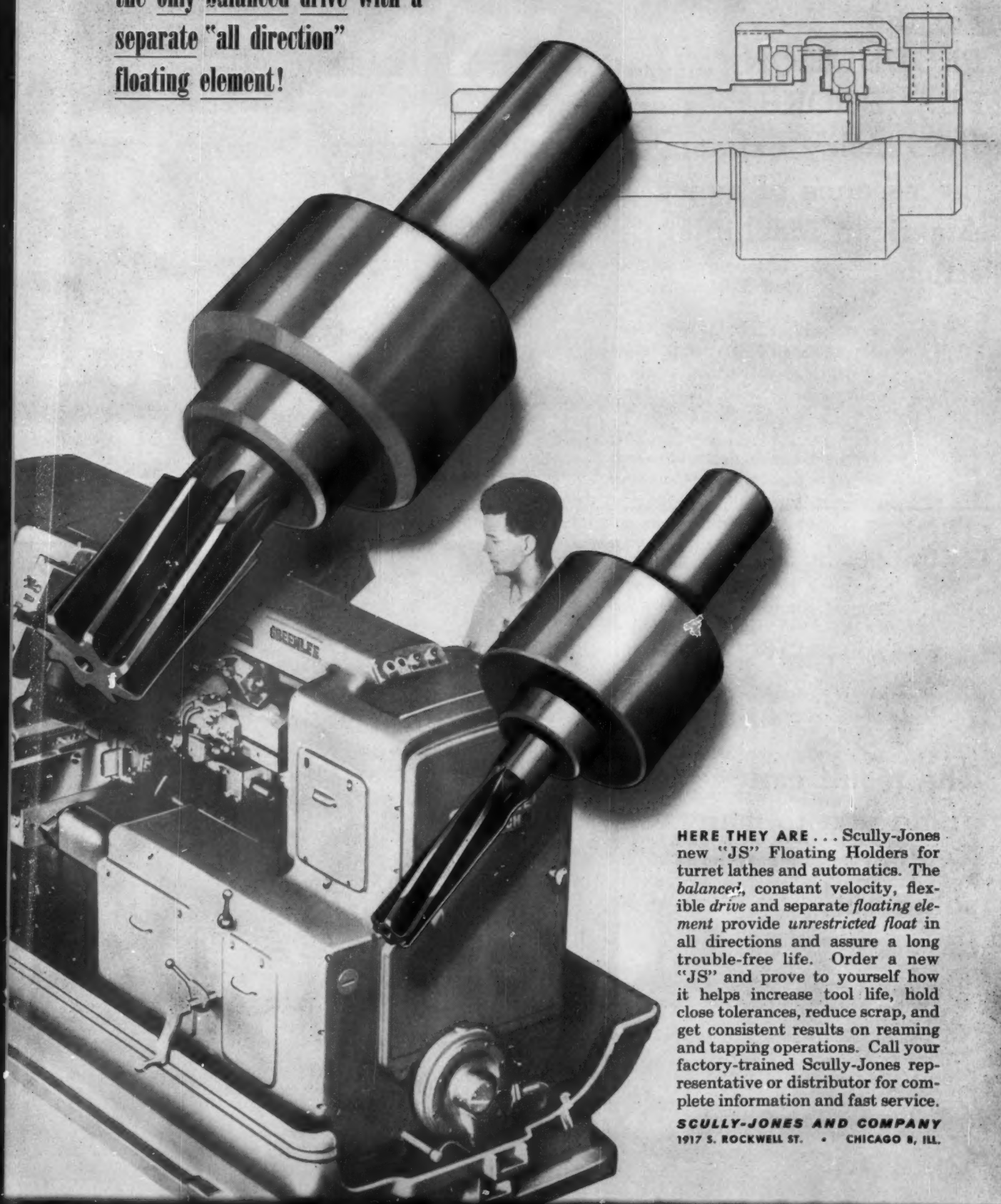

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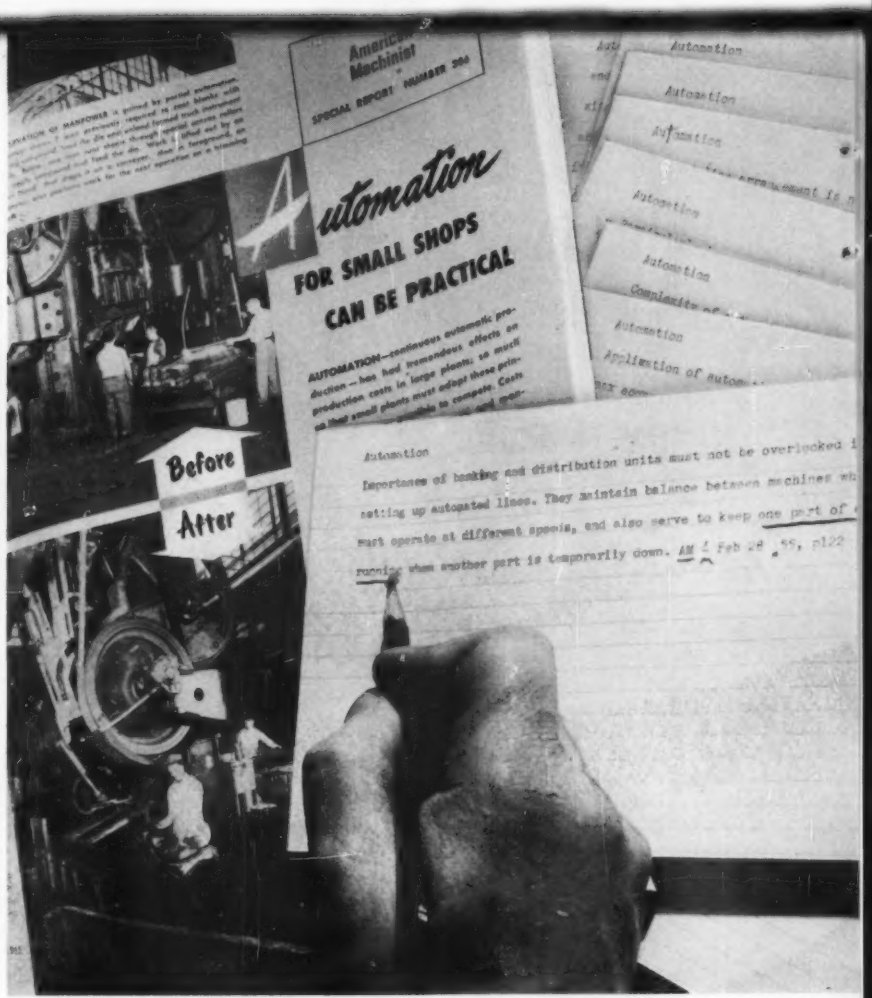

The result can
guide you to many
production-problem
solutions
for years to come

a new PRODUCTION PLANBOOK is coming in November

. . . it puts another year's *best production ideas* at your fingertips . . . all thumb-indexed, sectionalized, ready to solve every kind of production problem *fast*

Two months before last year's PRODUCTION PLANBOOK was off the presses, *American Machinist's* Associate Editor, Jim Linsley, was busy editing material for *this* year's issue. The result is an unbroken chain of crisp, condensed, continually useful keys to *all* the invaluable production ideas that are fully described in each year's issues of *American Machinist*.

Unless you are a very new reader of *American Machinist*, you know what a goldmine of useful ideas and facts the 1955 PRODUCTION PLANBOOK contains. Last November, it brought Metalworking's production executives a brand-new approach to making their subscriptions to a metalworking magazine pay maximum dividends:

This issue condensed to its essence every new production idea and method the previous twelve months' issues of *American Machinist* had reported upon . . . sectionalized them for quick reference . . . and told in which issue of *American Machinist* full details on each could be found.

Now, in the 1956 PRODUCTION PLANBOOK, this same tremendously useful service will be repeated, with another twelve months' issues of *American Machinist* forming the base for an issue you will find constantly helpful for years to come. And as a brilliant partner to the 1955 PRODUCTION PLANBOOK's 128-page Special Report on "How to Work Steel," the 1956 issue will bring you an equally valuable Special Report on:

HOW TO WORK NON-FERROUS METALS

Between now and November, Jim Linsley and his staff will be working *every day* to make the 1956 PRODUCTION PLANBOOK tremendously valuable to you. Watch for it. And remember that the 1955 PRODUCTION PLANBOOK is available to you now . . . with its thousands of helpful suggestions on how you can do a better production job. Review your copy again today, or ask your company library for one. Not only will you be very glad you did . . . but it will also serve to remind you of what to expect when the 1956 PRODUCTION PLANBOOK reaches you in November.

To be published by . . . American Machinist . . . in Mid-November, 1955
The McGraw-Hill Magazine of Metalworking Production
McGraw-Hill Building
New York 36, N. Y.

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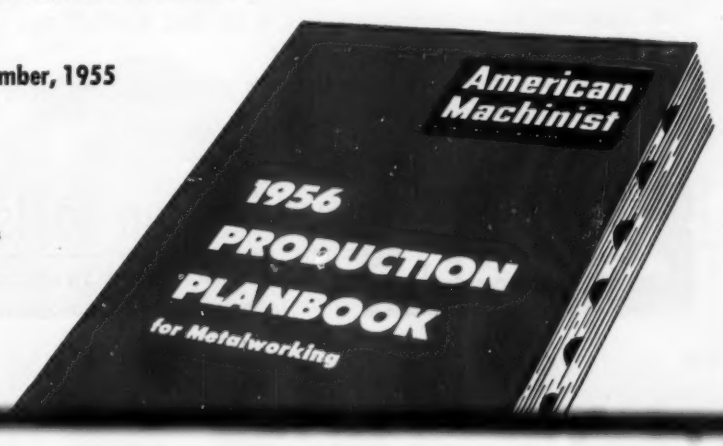

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combination SOCKET-TAP for re-tapping and cleaning tapped holes

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These and many other Apex production tools are described in Catalog 115; write, on your company letterhead please, for your copy.

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discipline there can be no efficiency. Without efficiency there can be no job security. Competition being the dominant factor in the free enterprise system, only the efficient survive.

Whiplash has a good motive. It has a good end. As a means, it is bad. Whiplash ignores the reaction of the human factor. Men are not motivated by logic alone. Their feelings and emotions play an important part in what they do.

Industrial workers have pride, they have a feeling of importance. They are men with responsibilities. They resent being treated like small boys.

Under our circumstances there are better ways of motivating the development of good work habits than by means of whiplash. In handling men for the past sixteen years the best approach proved to be the easy approach. Smile, talk things over in a casual manner.

Make your appeal to a man's wants and inherent desires. A worker wants to be important to his supervisor. He wants to be vital to the organization of which he is a part. He wants to be with the leaders in the forefront of progress. He does not want to be classified as a barnacle on the backside of progress.

A foreman who can satisfy the wants and desires of his men will have his wants satisfied in return. Sounds easy, doesn't it? We know it's not as easy as it sounds. A foreman finds a lot of monkey wrenches in the works when he tries to produce a high quality product at low cost on schedule.

A small percentage of industrial workers, all represented by belligerent bargaining agents, are dynamically averse to putting forth their best efforts. In my opinion, after twelve years of first-hand observa-

"Wish I knew who that guy is . . . he's been coming in late every day for the last week."

tion, less than five percent of industrial employees cause ninety percent of labor-management difficulty.

In the motivation of industrial workers a foreman can run up against stone walls not of his making. One must be patient, determined, and ever on the alert for new solutions to old problems. One must always weigh the reaction of the human factor. The easy approach is the best approach.

If you can't be easy, be as easy as you can.

Peter A Seward
Swampscott, Mass

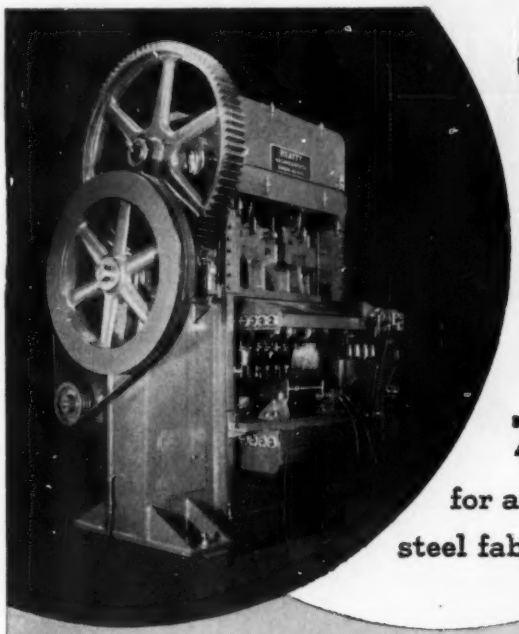
PROMISES, PROMISES

How flexible can an estimate be on the time involved for the completion of a job? Is the word of the man who will actually be doing the job accurate enough, or is it the responsibility of the foreman to set the time, subject to later amendment?

PROBABLY MOST OF US at various times have asked men how long jobs will take. Certainly I have, thousands of times, and in the long run the guesses or estimates made by the men have been remarkably accurate.

I have found however, that there are certain types of jobs in which it is useless to ask men how long it will take. The men can't answer you because they just don't know themselves. On most new jobs, where good drawings are available, a first-class man will be able to tell you very accurately how long it will take him to complete it. The time-study man can give you an even closer estimate. I am speaking of new work only.

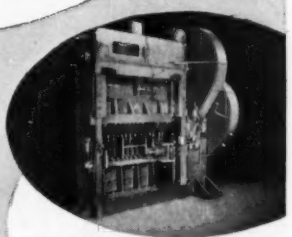
On repair jobs where the trouble factors are unknown, a worker's guess will probably not be very accurate. In a press shop, for instance, when the metal starts tearing on a certain die, it may take the toolmakers two hours or two weeks to



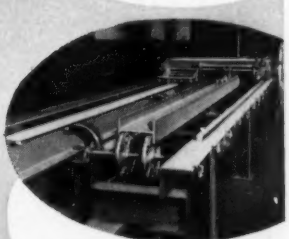
This Beatty Punch CUT COSTS 75%

for a structural steel fabricator

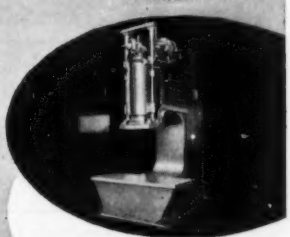
One of our present-day satisfied customers formerly employed machinery using only one punch for punching structural steel shapes. After consulting a BEATTY engineer, this firm installed a BEATTY Guillotine Beam Punch with an adjustable tooling feature that enables them to perform exact repeats of multiple punch patterns in 25% of the time formerly required. Naturally, we can't guarantee such substantial savings in every industrial installation of BEATTY machines! But, if you're currently considering additional production machinery for your metal fabricating plant, better see a BEATTY engineer before making any final decisions! Chances are he'll have an idea or two on how you can achieve greater production economies with BEATTY Machines!



BEATTY Guillotine Beam Punches are available for punching webs and flanges in "I" beams from 6" to 30".

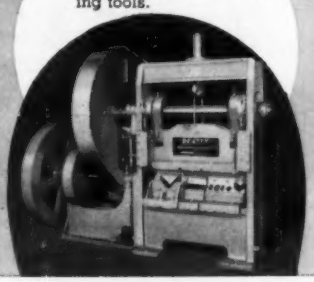


BEATTY Spacing Table handles web and flange punching without roll adjustment.



BEATTY Gap Type Press for forming, bending, flanging, pressing. Capacity 250 tons.

BEATTY
Guillotine Bar Shear for angles, bars, rounds, squares without changing tools.



BEATTY
Machine & Mfg. Company
HAMMOND, INDIANA

ELECTROLYTIC GRINDING with ELECTRONIC control CUTS COSTS as much as 60%

Anocut's NEW free manual tells how!

Here are the facts behind the theory, practical application and benefits of electronically controlled electrolytic grinding by new equipment perfected by Anocut Engineering Company. This informative manual covers the Anocut equipment necessary and its simple operation in grinding and shaping carbides, alloy steels and other hard-to-work materials. Presents documented field tests showing, for example:

Over 90% savings in diamond wheel costs
Far faster cutting speeds
Better, more uniform finishes
Longer tool life

Send for your copy today! Manual will be sent by return mail on receipt of coupon below.

ANOCUT†
†The electronic "plus" in grinding

Anocut Engineering Company
141 W. Jackson Blvd.
Room 2300, Board of Trade Bldg., Dept. A
Chicago 4, Ill.
Send copy of "The New Electrolytic Shaping Method"

NAME_____
POSITION_____
FIRM NAME_____
ADDRESS_____
CITY_____ STATE_____

eliminate the trouble. And these toolmakers are not laying down on the job, either. With all their experience they just don't know which one of 50 factors is causing the trouble. Eventually they'll find the cause and remedy it, but the eventually will not be now.

On any one job, and certainly on important jobs, I would say it is permissible to get a time estimate from the men doing the job. I cannot remember any shop or plant in my experience where the toolmakers are expected to estimate all the time on their own jobs. I think that would be expecting a little too much. It sounds too much like turning the shop over to the men to run, and that is asking the tail to wag the dog.

Management has the responsibility of deciding on the product to make, the price at which it shall be sold, and the conditions under which it shall be made. It is the privilege of management to select and hire their own time-study men, estimators, and workers. After setting up their own organization, it seems to me to be a confession of weakness on the part of management to admit their own organization won't function by asking the worker to estimate his own probable time on the job.

My personal opinion would be that it is undesirable to expect time estimates from toolmakers on all jobs. It is also impractical, would encourage men to lengthen out the time required to do jobs, and would lower the prestige of the management in the worker's eyes. I can see no value in the practice unless it be in a very small, struggling shop.

James K Matter
Detroit, Mich

ASKING A WORKER to guesstimate how long a job will take when he starts out on it, and give the foreman a promised completion date is neither a fair nor valid demand because it is based on the assumption of an educated guess.

There is nothing practical or realistic about a promise extracted from a worker to complete a job in a specified time if he is permitted a plus completion tolerance that permits over-estimation. Who is to decide if his guess is reasonable, and what standards are available to measure the educated guess? What's to prevent the worker from adding a completion safety factor of 25 percent just to be on the safe side?

The general premises of the case under discussion appear to indicate applicability to a small shop. The larger shop which could afford time and motion studies, standard determination, and work instruction cards would have little or no occasion to ask workers for promised completion dates for various jobs or aid in estimating work loads and dates for finished work. Such matters are more efficiently and accurately performed by the Production Control, Estimating, Scheduling and Routing Departments of the plant. When work standards are accurate and consistent, estimating problems become non-existent. Estimates are taken out of the hunch category and planning work loads and completion dates are realistic. Delivery dates for finished work can be forecast with confidence.

Most machine shop jobs are alike because production jobs have a set time and motion pattern. With time and motion studies, and subsequent instruction cards for various jobs

DID ONE OF THE BOYS TELL YOU TO BRING THAT OLD MACHINE PART IN HERE AND PUT IT THERE WITH THE PARTS THEY TOOK OFF THE NEW MACHINE?
NAW—Y'KNOW NONE OF T'BOYS WOULD DO A THING LIKE THAT!
MUST BE AN OLD BOOK (I HOPE)
MACHINE REPAIR
DEPT 1101
"EGO BUSTIN'"

MEMORANDUM
Write to J+L for this new book on the modern method of heat treating cold finished steel bars
NOTE:
Electreat (the modern J&L method) is characterized by exceptionally accurate control of heating and quenching.
Electreated bars can be used to produce parts having heat-treated properties—without the need for costly and perhaps undesirable heat-treating operations.
For some products, you may use Electreated carbon steel in place of alloy steel.
ELECTREAT
J&L STEEL

You can help us place a copy of this *new* book in your hands. Please give us your name and address. We'll do the rest. It will be *mailed* without cost to you—no intrusion on your time.

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

Jones & Laughlin Steel Corp., Dept. 402
3 Gateway Center, Pittsburgh 30, Pa.

Please send me a copy of your new ELECTREAT booklet.

NAME_____

TITLE_____

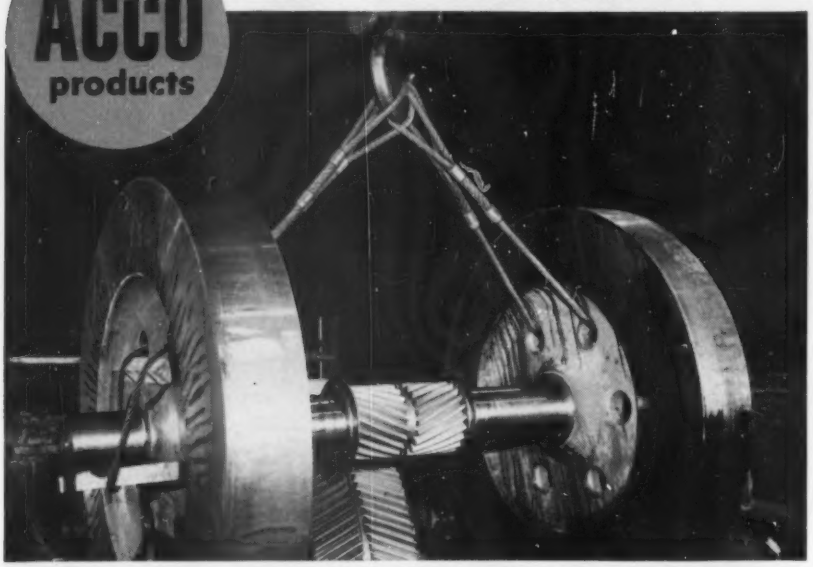
COMPANY_____

ADDRESS_____

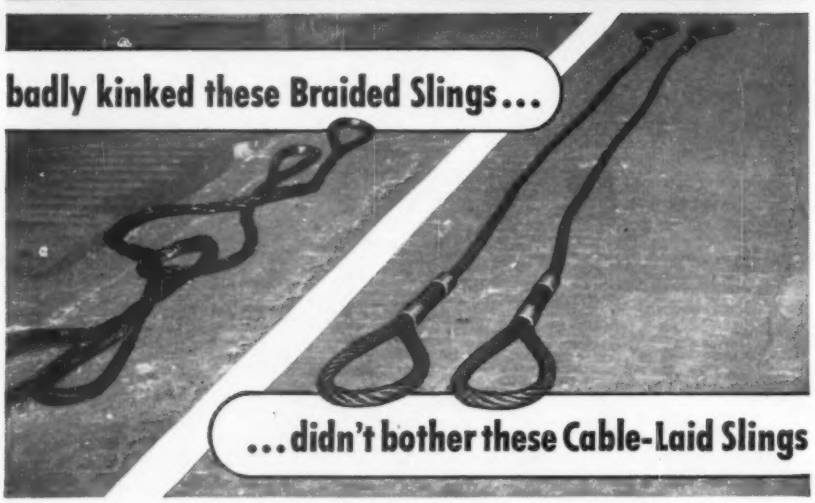
CITY_____ ZONE_____ STATE_____

ACCO products

This 34-Ton Load...



badly kinked these Braided Slings...



...didn't bother these Cable-Laid Slings

Here's Why:

Because these ACCO *Registered* CABLE-LAID slings combine the flexibility of manila rope with the strength of steel.

The secret of the CABLE-LAID sling is in the construction of the rope. It's a combination of six wire ropes laid around a special steel center to give you a rugged steel body which has:

- **Freedom from Crankiness**
- **Extreme Flexibility**
- **Resistance to Kinking**

With their patented DUALOC endings these CABLE-LAID slings are tops in ease of handling . . . resist abuse . . . and give you longer sling life which reduces lifting costs. And these slings are ACCO *Registered*—with all the advantages that make this specification the standard of efficiency and safety.

See your ACCO Registered distributor or write our Wilkes-Barre, Pa., office today

ACCO TRADE MARK

Wire Rope Sling Department
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. • In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

for Better Value

available, it will be found that estimates and schedules for new work can be prepared on a firmer basis. The use of past recorded experience available in the studies and instructions takes estimating out of the realm of fancy. Another thing to remember before asking the worker for a guessed promised completion date is that the average worker does not produce at his best level without a goal toward which to work. And if he knows that the foreman as well as he has no exact knowledge on how long a job should take, he will take as much time as he thinks he ought to. This of course, in many instances, is an open invitation to loafing and soldiering on the job.

In the smaller shops good methods of estimating work loads and job completion dates are as important as in large shops. However, due to limited operating capital, extensive time and motion studies and work standardization and simplification are not possible. Small-shop planning demands consideration of the economics of the job in order to arrive at a sound estimate for completion of the finished work. The number of pieces to be made has to be considered. Their cost by conventional methods must be determined. This figure will provide a rough idea of how much time and effort can be spent profitably on tooling and job planning. Naturally, anything spent on developing an efficient method of work must be returned in the form of lower costs within the life of the job. The trick then is to get the most for the money in planning the job within its cash return limits.

"Heh, heh . . . coffee . . EEE . . . BREAK-K-K!"

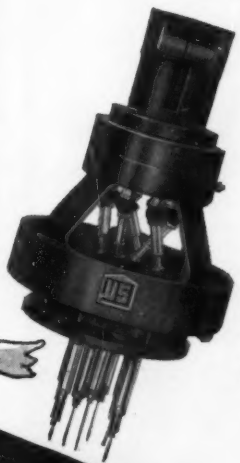
We're Looking for Head Hunters!....

Most machine tool men have long relied upon the "US" Adjustable Multiple Spindle Drill Heads. But we are looking for those who still haven't tried them . . . and who are looking for the best.

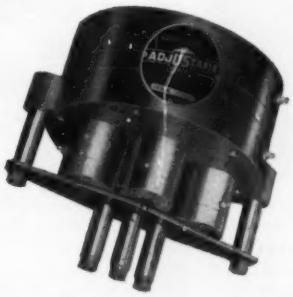
With their quick-change universal joint assemblies, they are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating. All gears are hardened and shaved with spindles superfinished.

The single eccentric type is used for equally spaced holes on bolt circles.

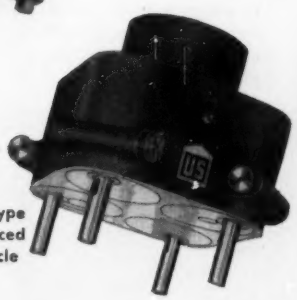
The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.



Universal joint with slip spindle fixed locating plate



Double eccentric type for irregular spacing



Single eccentric type for equally spaced holes on bolt circle

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

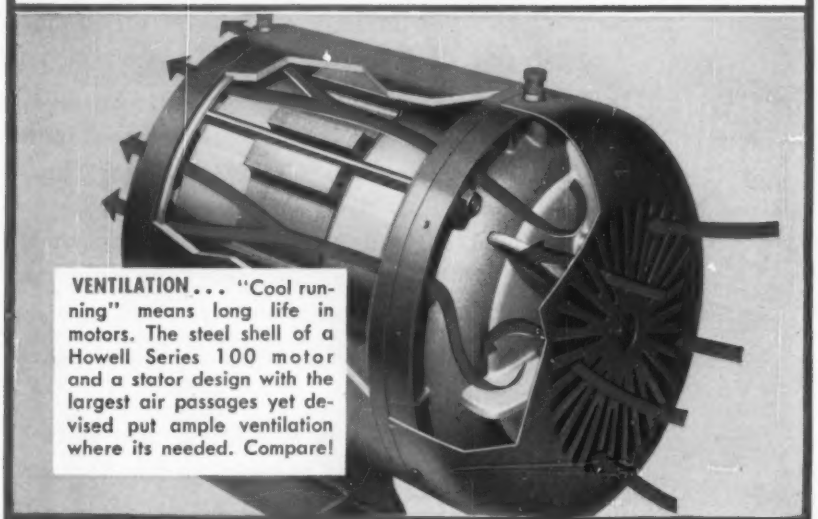
UNITED STATES DRILL HEAD COMPANY

616-618 BURNS STREET • CINCINNATI 4, OHIO

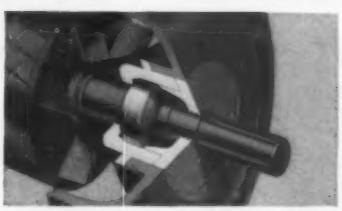
to ***MACHINE BUILDERS, Howell suggests***

What to look for in the new re-rated motors

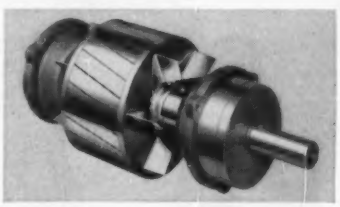
If you've investigated the space and weight saving advantages of the new NEMA re-rated frame sizes, you've observed the variation in the constructions motor manufacturers offer to meet the new standards. The prices may be the same . . . but why not insure that you get the most for your money? Below are some point for comparison . . . and a few of the reasons why the Howell "Series 100" motors are so outstanding!



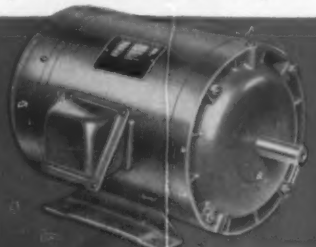
VENTILATION . . . "Cool running" means long life in motors. The steel shell of a Howell Series 100 motor and a stator design with the largest air passages yet devised put ample ventilation where its needed. Compare!



BEARINGS They should be fully protected. Dirt can't enter Howell's cartridge-type, double shielded bearings either from inside or outside the motor. On TEFC motors, cartridge remains sealed when end plates are removed. Compare!



ALL-COPPER ROTORS Howell motors have all-copper rotors. This means better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet special requirements. Compare!



The new Howell Series 100 TEFC Motor

SMALLER • LIGHTER • COOLER • MORE STREAMLINED. TEFC and Open Drip-proof types have the same diameter . . . are completely interchangeable.

WRITE FOR THE SERIES 100 CATALOG

HOWELL MOTORS

Howell Electric Motors Company, Howell, Michigan

Good estimating on jobs, and meeting desired completion dates, depends on making sure that the workplace layouts conform to the basic principles of motion economy. This can be done visually by any experienced foreman or shop owner and will aid in determining the best way of doing the job. A capable foreman will plan the setup for fast operation and a minimum of handling and may apply these points to virtually all jobs, with little expense to install. Production control cannot be elaborate, yet it must get the work out on schedule.

Harry Kaufman
Philadelphia, Pa

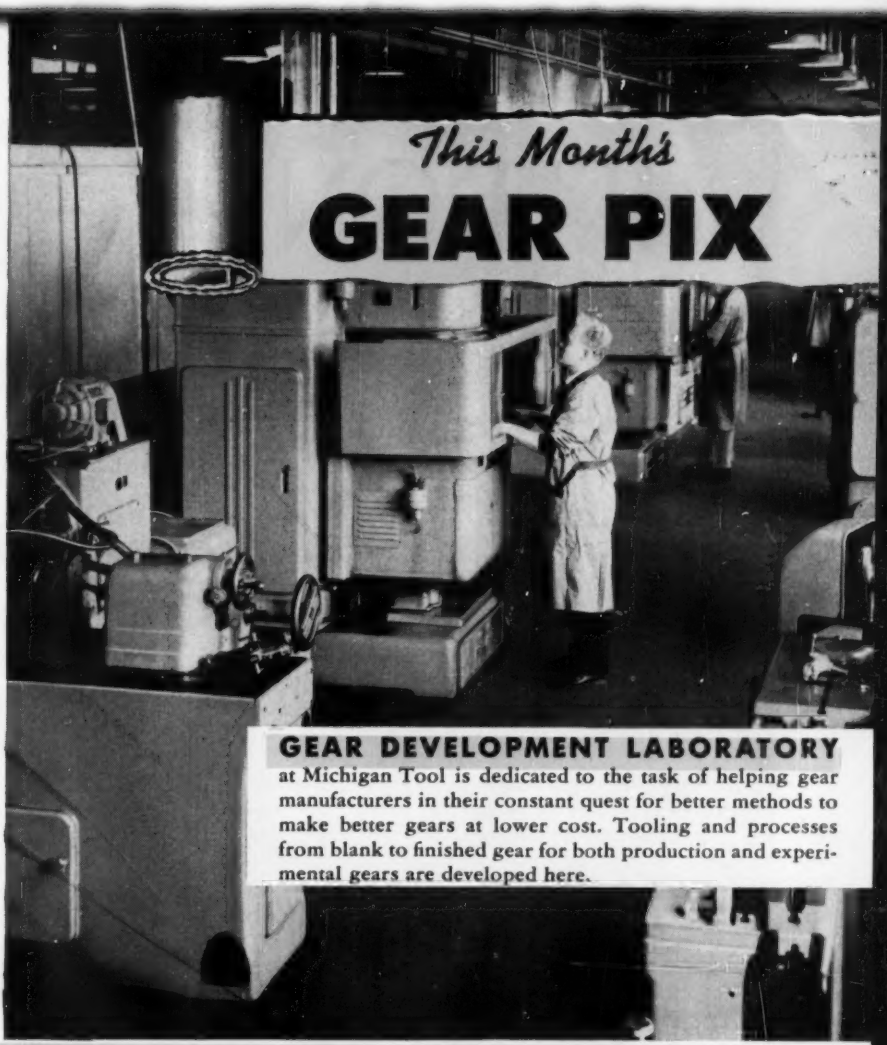
IT SEEMS RATHER UNUSUAL for a shop foreman to admit his inability to make an estimate of the time required to do a job. The promise system wouldn't help out in this case as the basis of its success is an estimate of time which, if underestimated, can be corrected.

Maybe Ed doesn't know how to estimate. Some people are of the opinion that an estimate is an ironclad statement of actual time to do a job. In making an estimate the person forms an opinion by using his past experience as a guide. If that won't work, then he can resort to the method of analysis wherein he breaks down his job into its components and builds his total.

There is an expression, "Your guess is as good as mine," and this certainly applies in time estimates on jobs. Some fail to realize that an estimate is merely a guess and should be treated as such. Many a row has been caused by an individual who couldn't take an estimate at a loss. He's the lamebrain who always

"The boss made a big hit at the bowling award banquet last night . . . when called on to make a speech he declined."

HELICAL, TAPER, OR STRAIGHT involute splines like these are rolled in a few seconds. ROTO-FLO spline roller forms accurate splines up to thirty times faster at lower cost. (Bulletin RF-54.)



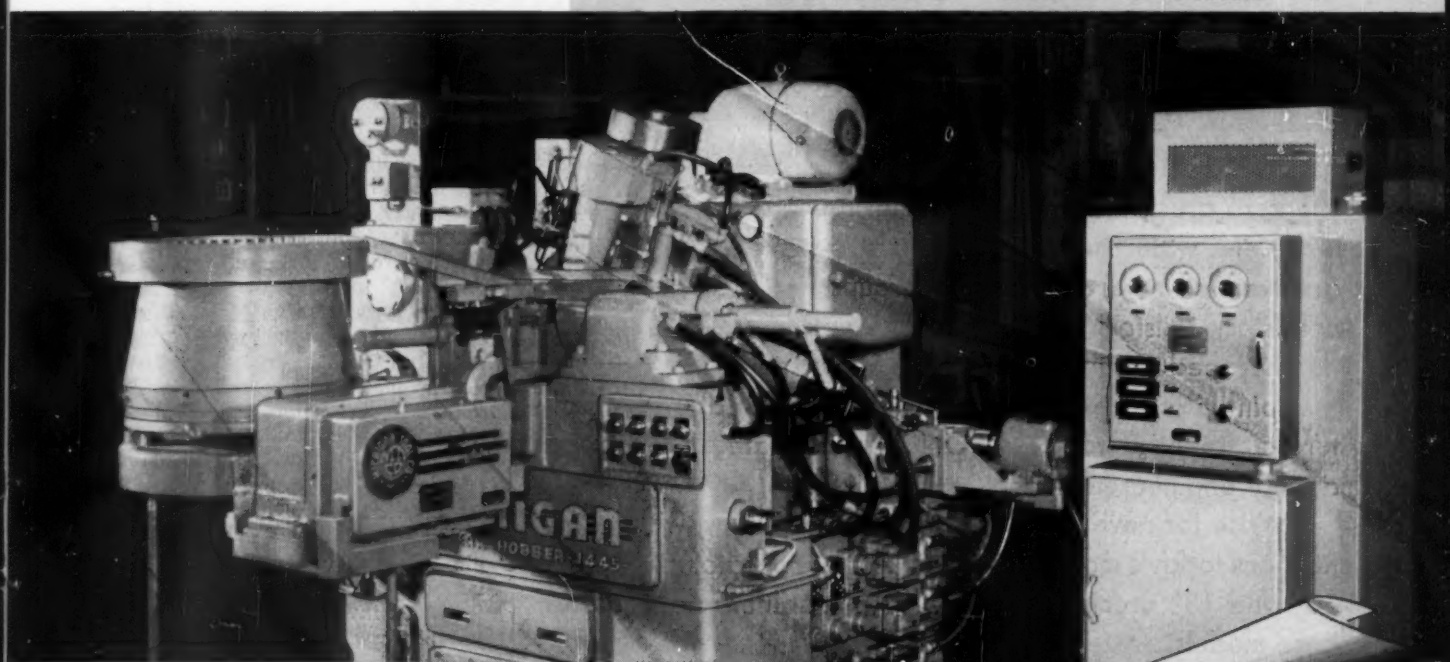
This Month's

GEAR PIX

GEAR DEVELOPMENT LABORATORY at Michigan Tool is dedicated to the task of helping gear manufacturers in their constant quest for better methods to make better gears at lower cost. Tooling and processes from blank to finished gear for both production and experimental gears are developed here.

MACHINE TOOL SHOW

AT CHICAGO—SEPT. 6 THRU 17



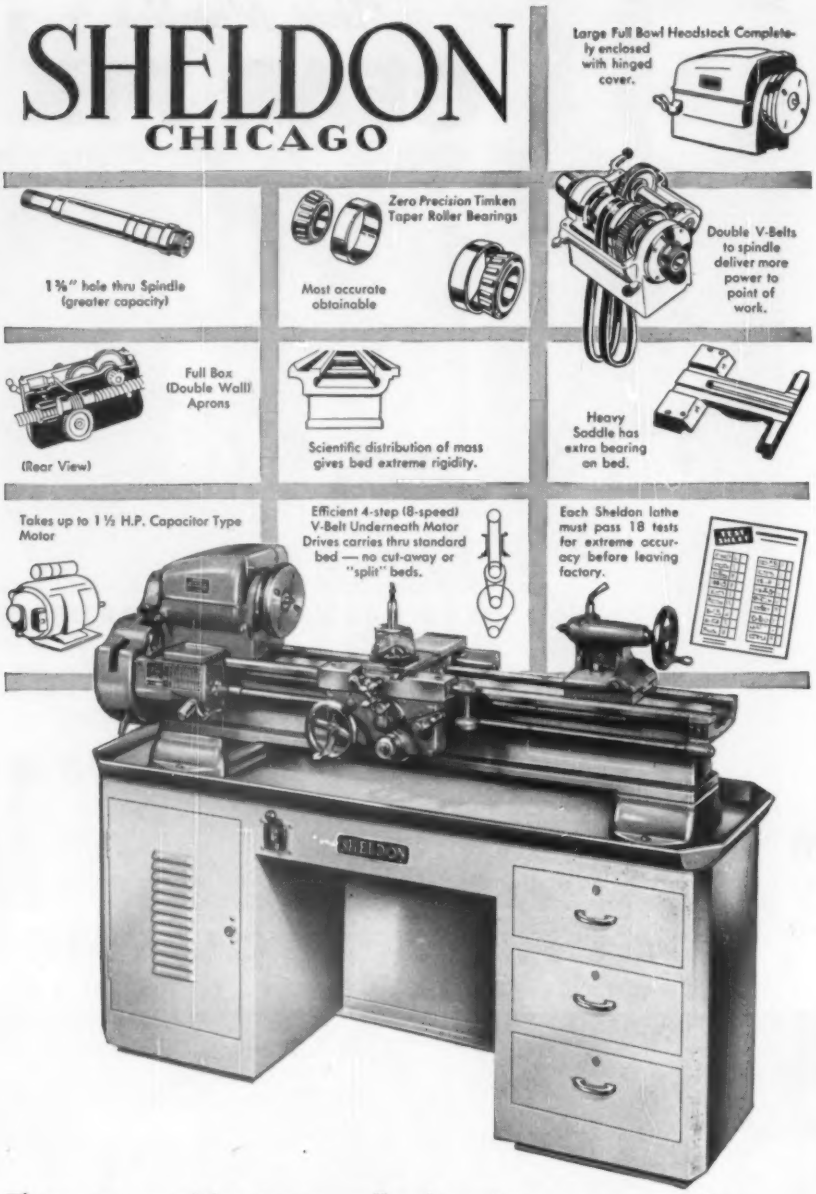
HOBBER "THINKS" FOR ITSELF, keeps records on production, shifts the hob, adjusts hob-gear center distance for correct gear size, shuts down for helix errors, loads and unloads—all automatically. This new, completely automated 1445 Ultra-Speed gear hobber hydraulically crossfeeds the hob at the helix angle of the gear. (Bulletin LH-54.)

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO., LTD.

SHELDON
CHICAGO


Large Full Bowl Headstock Completely enclosed with hinged cover.
1 ⅝" hole thru Spindle (greater capacity)
Zero Precision Timken Taper Roller Bearings
Most accurate obtainable
Double V-Belts to spindle deliver more power to point of work.
Full Box (Double Wall) Aprons
(Rear View)
Scientific distribution of mass gives bed extreme rigidity.
Heavy Saddle has extra bearing on bed.
Takes up to 1 ½ H.P. Capacitor Type Motor
Efficient 4-step (8-speed) V-Belt Underneath Motor Drives carries thru standard bed — no cut-away or "split" beds.
Each Sheldon lathe must pass 18 tests for extreme accuracy before leaving factory.
SHELDON

The zero precision taper roller bearings are large and wide. The bed ways (two V-ways and two flat ways) are precision ground, with headstock tailstock and carriage accurately handscraped to them. The double V-belts to the spindle are Neoprene cogged belts . . . feature by feature, detail by detail SHELDON Precision Lathes have extra quality engineered and built into them.

Write for new Catalog No. G-55 illustrating with specifications oday's most advanced line of moderate priced 10", 11" and 13" precision lathes—bench, cabinet and pedestal base models.

Sheldon Machine Co., Inc.
4234 North Knox Avenue, Chicago 41, Illinois

howls when the time taken to do a job has been a little long. You don't hear a peep out of him when the job is turned out in less time.

In order that these misunderstandings be eliminated we can resort to the promise system, the mechanics of which are such that adjustments in the time element can be made as the job progresses. By augmenting the original estimate with corrections to allow for such things as human frailties and unforeseen contingencies, the way is paved with better understanding. There is always the way open to inquire into why.

We've had mathemechanics suggested to us to conserve time, so why not put on a guestimator for the same reason? Here would be a chap entirely capable of handling the job, thereby saving the time of the men. This new addition should be a man of wide experience and sound common sense. He should make his estimates conformable to normal working speed, yet keep in mind the interest of the company. Periodic checkups should be held to ascertain how close to the button he hit the mark of past jobs so as to lead him to better averages in the future. Rather than have a man use his estimating time as an excuse for stalling he could put it to better use in carrying out his instructions.

Ed has an idea that making out an estimate, allowing plenty of time to do a job, is a pretty good way to have an easy time. That may be true in some cases, but I do not think that the majority of workers delight in padding the payroll with idle time. Most of them take considerable pride in their work and will give a good account of themselves—providing they are not the victims of unreasonable foremen. In giving out an estimate considerably less than a man can do a job, and doing this regularly, is dishonest.

I had a case recently of an estimate made out by a supervisor which, in the final analysis, resulted in the worker being called on the coals for taking too much time on the job. The original estimate went through the office with the final time it took to do the job, and naturally the big shot flew off the handle. The estimate wasn't made by the worker himself but it was the product of a lamebrain who had no conception of the work involved. If you are going to look forward to conscientious application to the work assigned to the boys, for the love of Mike give them a fair deal in estimated time.

Lawson Kinsley
Pottsville, Pa

at the helix angle of the gear. (Bulletin LH-54.)

7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.

Two Mack-Hemp AXY Straighteners straighten Titanium tubing to tolerances closer than commercial specifications, in sizes up to 1¼" O.D., at Superior Tube Company, Norristown, Pa.

Superior TITANIUM TUBING

STRAIGHTENED IN ONE PASS

thru MACK-HEMP guideless Rotary Straighteners

Titanium tubing, combining light weight and high strength, is considerably more difficult to straighten than some other types of metal tubing, due to its tendency to gall or seize when being worked with other metals. In spite of these characteristics, Superior Tube Company straightens thousands of feet of Titanium tubing in one pass thru its Mack-Hemp Straighteners.

Moreover, these Mack-Hemp Rotary Straighteners help to improve production of Superior Titanium Tubing in other ways:

- **less work-hardening of the tubing results**
- **better product finish • speed on large production runs**

These same Straighteners are also used for straightening Superior's stainless, alloy and carbon steel tubing. In fact, Mack-Hemp guideless Rotary Straighteners are successfully used in all kinds of ferrous and non-ferrous tubing manufacturing. So, if you have any tube straightening problems—no matter what type of metal tubing—get in touch with Mack-Hemp for a helpful discussion or write for Technical Bulletin #55—"How to Straighten Pipe and Tube."

MACKINTOSH-HEMPHILL
COMPANY

Makers of the rolls with the striped red wabblers

PITTSBURGH AND MIDLAND, PA.

MACKINTOSH-HEMPHILL PRODUCTS INCLUDE: all types of cast mill rolls . . . improved Johnston patented corrugated cinder pots and slag handling equipment . . . Mackintosh-Hemphill rotary straighteners . . . electronically controlled contouring lathes . . . screw feed roll turning lathes . . . heavy duty engine lathes . . . shears . . . end-thrust bearings . . . steel and special alloy castings . . . reversing hot strip mills . . . Y-type cold strip mills.

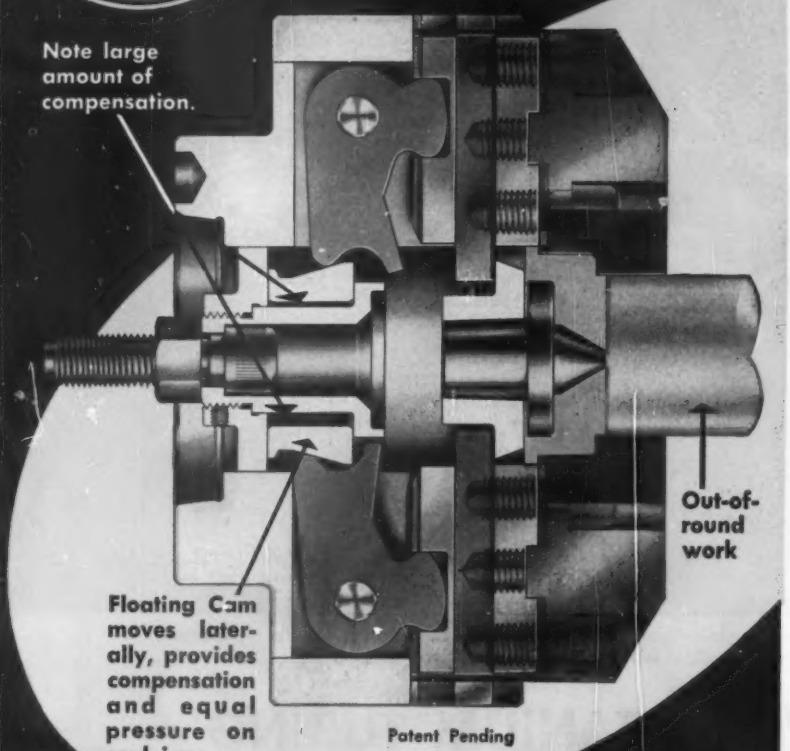
I would like to have a copy of Bulletin #55 giving case histories and detailed information on Mack-Hemp guideless Rotary Straighteners.

Name_____

Company_____

Address_____

New—
COMPENSATING
POWER CHUCKS


Note large amount of compensation.
Out-of-round work
Floating Cam moves laterally, provides compensation and equal pressure on each jaw.
Patent Pending

Grip out-of-round work

Rough forgings, out-of-round castings, finished pieces with round or irregular gripping surfaces . . . the S-P Compensating Power Chuck grips them all, with equal pressure on each jaw. The famous S-P cam and lever action provides longer jaw travel and greater gripping power, that permits cost-cutting heavy feeds and multiple cuts.

Available in 8", 10", 12" sizes; 2- and 3-jaw models.

Representatives in principal cities. Prompt deliveries. Send for Catalog 105, which includes S-P Self-Centering Power Chucks and Rotating Cylinders. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916
AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
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New Books . . .

INTERPRETATION OF ENGINEERING DATA: SOME OBSERVATIONS — *By Harold F Dodge, quality results engineer, Bell Telephone Laboratories. Published by the American Society for Testing Materials, 1916 Race St, Philadelphia, Pa. 36 pages, 6x9 in. Price $1.50.*

For the 1954 Edgar Marburg Lecture before the ASTM, Mr Dodge chose to talk about observations on the subject from the viewpoint of quality engineering, ie, sampling and quality control techniques with particular reference to engineering problems of specification, production and inspection.

Essentially, the lecture is mathematical in nature, basic in character, and valuable because the author drew from 25 years or so of experience. Those who have a desire to get to the root of statistical methods of quality control would do well to obtain a copy of this publication.

•

ELECTROPLATING ENGINEERING HANDBOOK—*Edited by A. Kenneth Graham. Published by Reinhold Publishing Corp, 430 Park Ave, New York 22, NY. 650 pages, 6½x10 in. Price $10.*

Prepared with the assistance of a group of six associate editors, all of whom bear names familiar to the electroplating industry, and containing contributions from an imposing list of experts in the field, this new volume deals with the engineering aspects of plating. It has been written primarily for the electroplater and electroplating engineer, but will prove of real value to the designer, manufacturer, supplier, purchaser, and user of electroplating and plating equipment.

Part 1 covers the supporting data necessary for electroplating engineering, and deals with cleaning, electropolishing, water, waste, and metal-surface treatment. Part design, specifications, processing, bath compositions, analysis, safety, costs, and metallurgy are also included.

Part 2 deals with the engineering of plating installations and covers such items as floors and foundations, tanks, linings, racks, heating and cooling, electrical systems, plating machines, filtration, auxiliaries, and general maintenance.

The arrangement of the book is unusual in that the glossary of terms

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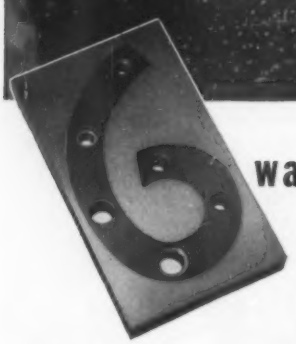

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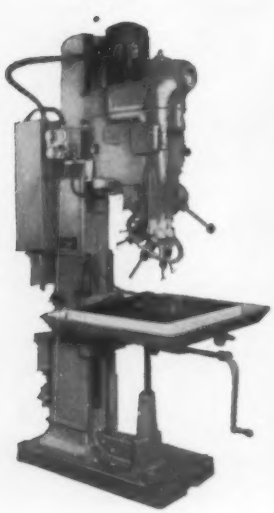

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and tables of data are at the front—an arrangement that most users will find extremely convenient.

•

MAGNETIC CONTROL OF INDUSTRIAL MOTORS (SECOND EDITION)—*By Gerhart W Heumann, Industrial Control Dept, General Electric Co. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, NY. 714 pages. Price $9.50.*

In these days of automation, transfer machines, and high-production equipment in general, the electrical controls and drives on shop equipment are of critical importance. Machine-tool and special-machine building companies have for some years now had to use electrical engineers to lay out the control functions. In the shops of big users of equipment, electrical engineers and maintenance electricians have assumed greater importance, both in respect to defining what is needed in control equipment and seeing that it is kept functioning properly.

Therefore any book on this subject of industrial controls is important to many people in the metalworking industry. This book merits special attention because it is one of a series sponsored by the General Electric Co.

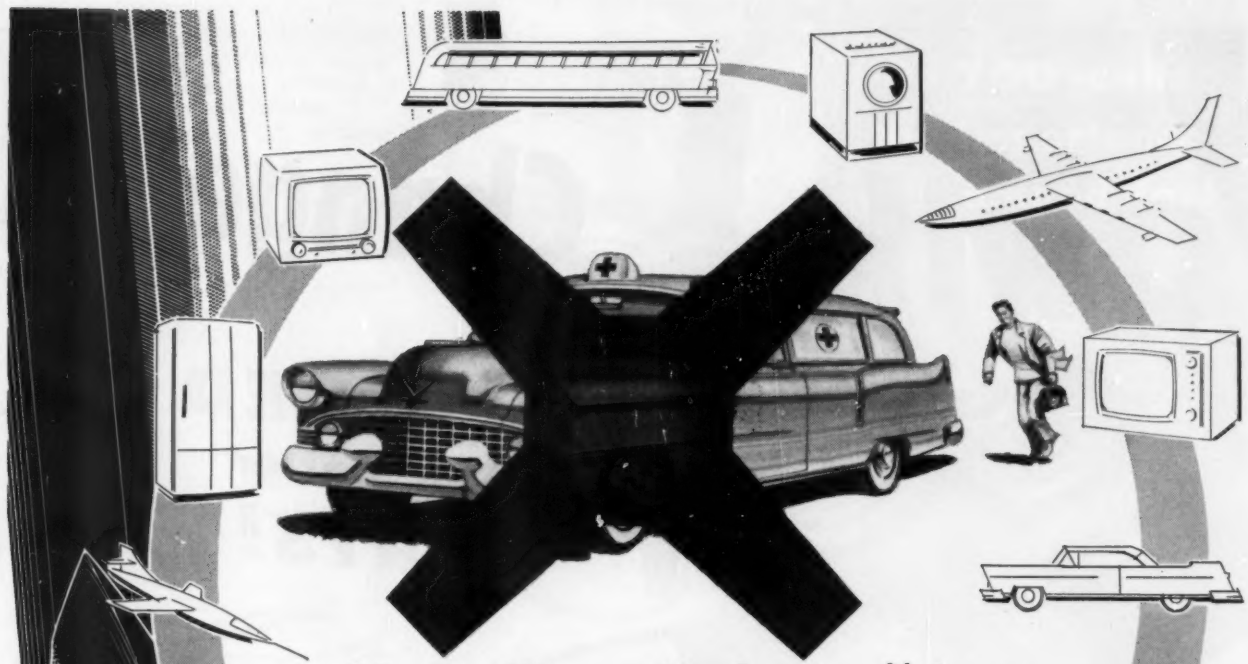
Since 1947, when the first edition appeared, many changes have taken place in the design of control components and systems. Feedback and closed-cycle control systems, for example, will be used more extensively in shop equipment. To cover these recent advances, the author has revised the text of his earlier edition and expanded it by 20%. With this book, the user can select the proper type of controller for a given application. By understanding its operation, he can make proper provision for its maintenance when necessary.

•

DICTIONARY OF METALLOGRAPHY — FIRST AMERICAN EDITION — *By R T Wolfe. Published by The Chemical Publishing Co, 212 Fifth Ave, New York 10, NY. Price $5.75.*

Nowhere else, according to present information, can you find a real dictionary—an encyclopedia, if you will—of the terms important in metallurgy. This book is written by an Englishman, but he has had ample access to American terminology and usage.

When he was working up the first British edition (sold out in a few months), Mr Wolfe found that only a few metallurgical terms are de-



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fined in specifications of the ASTM, the British Standards Institution, and other bodies. The same paucity of information was also revealed in books and technical papers. And, too, the writers might talk all about a term without actually defining it.

What we have here, then, is a book that defines and explains 1350 terms in about 111,000 words, with of course many revisions as compared to the first edition published abroad.

Metallurgical terms, as treated by the author, cover not so much the arts of extracting ores, but rather the treatments and processes applied to metals and alloys after their refraction and refining. In addition, included are terms relating to constitutions of metals and alloys, internal structures, physical properties and behavior in service. In short, there is little distinction between physical metallurgy and metallography. The latter obviously includes in addition to the above, micrography, macrography, radiography, magnetic and mechanical testing. Then, too, for a well-rounded but concise dictionary, the author had to add terms in chemical, physical, electricity and magnetism.

Obviously, the book will save a great deal of time and lead to a firmer grasp of the subject matter, when the reader can use the dictionary in conjunction with books and technical papers dealing with metallurgy and metallography.

•

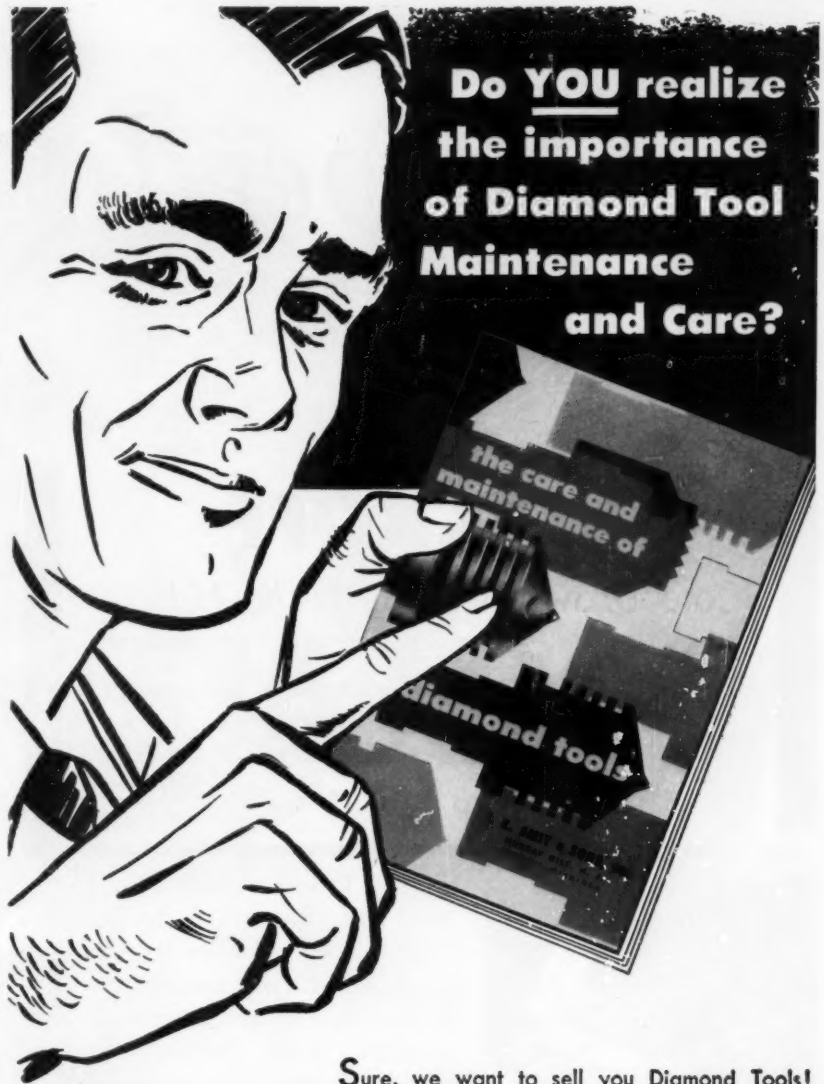
ASTM STANDARDS ON COPPER AND COPPER ALLOYS — *Published by the American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa. 600 pages, 6x9 in. Price, $5.00 with paper cover; $5.65, cloth cover.*

This book brings together all of the ASTM Standards pertaining to copper and copper alloys.

This edition includes in their latest form 123 ASTM standards, including 108 specifications; 10 test methods; two classifications: one of coppers, the other of cast copper-base alloys; two recommended practices: one for tension test specimens for copper-base alloys for sand castings, and one for designating significant places in specified limiting values; and one hardness conversion table for cartridge brass.

In this special compilation, 50 of the specifications included in the earlier edition have been revised and eight of the standards are new.

New material includes specifications and test methods for: round



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chromium-copper wire for electronic devices; seamless copper tube for refrigeration field service; copper and copper-alloy die forgings (hot-pressed); soft or annealed, coated-copper conductors for use in hookup wire for electronic equipment; copper-zinc-manganese alloy (manganese brass) sheet and strip; nickel-tin bronze castings; determination of cross-sectional area of stranded conductors; and stiffness of bare soft square and rectangular copper wire for magnet wire fabrication.

Standards cover: specifications for electrical conductors; plate, sheet, rolled bar, and strip; rod, bar, and shapes; non-ferrous metals; wire; pipe and tube; ingot; sand and die castings; filler metal; and methods of test for copper and copper-alloys.

•

STANDARDS FOR A STRONG AMERICA —*Published by the American Standards Association, 70 East 45 St, New York 17, NY. One hundred, 8½ x 11-in. pages. Price $3.*

This book contains 40 papers delivered at the procedings of the Fifth National Conference on Standards held last November. Included are papers on the new era of standards by Dr John Gaillard, recent developments in American standards for surface finish, what the purchasing agent wants from the engineer in standardization, and evaluating the results of a quality-control system in the plant.

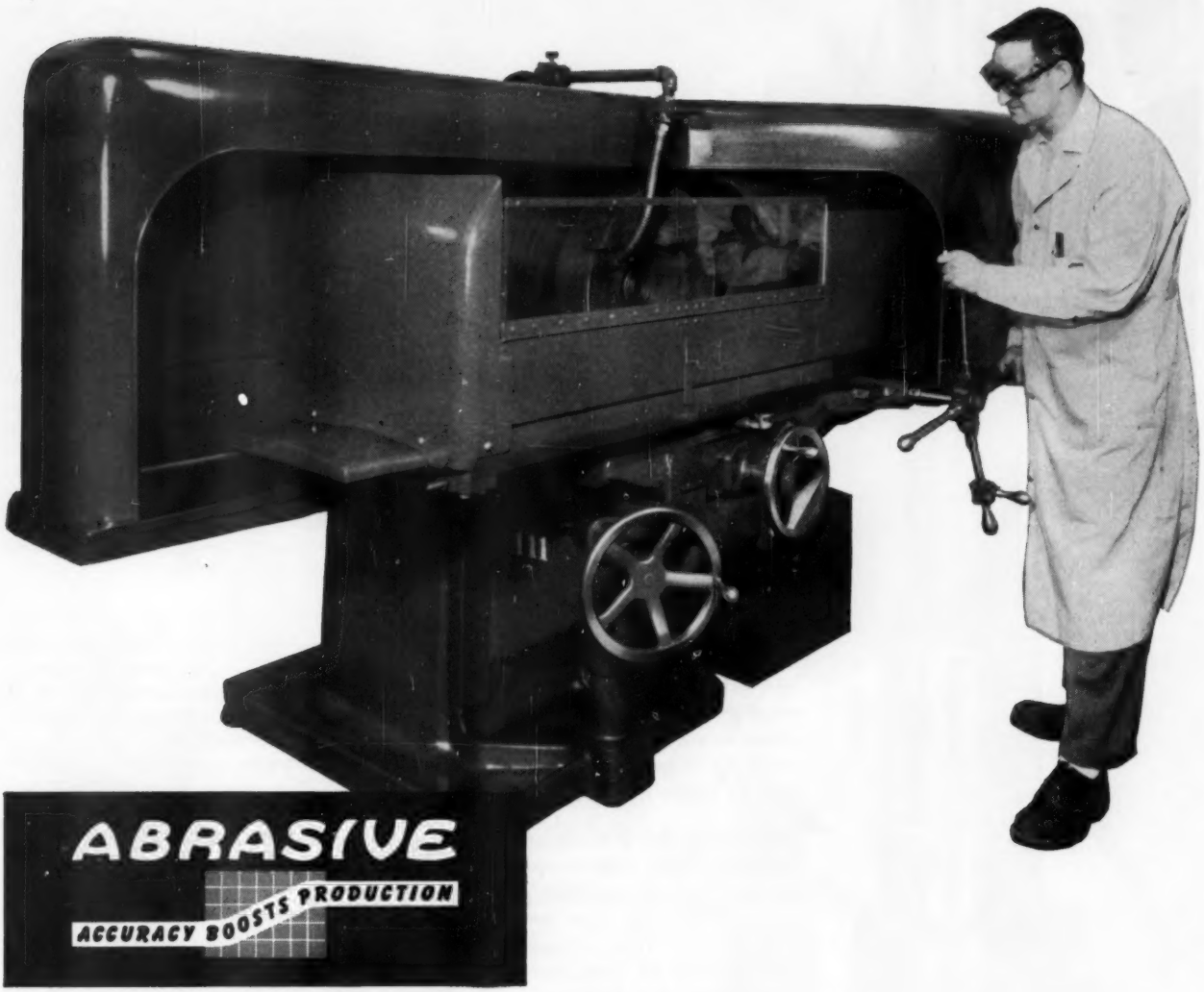
Other papers are outside of the scope of Metalworking.

Names in the News . . .

Frank W Reinhart, chief of the Organic Plastics Section of the National Bureau of Standards, has been elected president of the Society of Plastic Engineers.

Elbert R Faust, formerly works manager of H M Harper Co, Morton Grove, Ill, has been elected vice president, manufacturing, of Waterman Pen Co, New York.

Dr Frederic de Hoffmann, associated with the atomic energy program for the past 11 years, and most recently a consultant to the Joint Congressional Committee on Atomic Energy, is joining Convair, Division of General Dynamics Corp, San Diego, Calif, as assistant vice president for nuclear planning.



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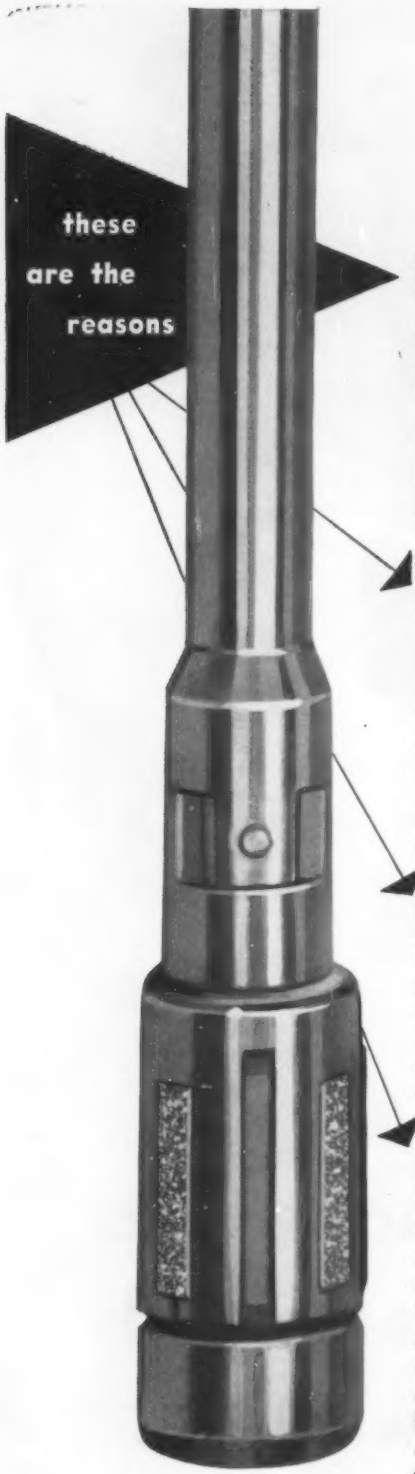

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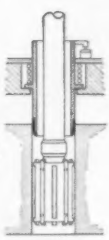

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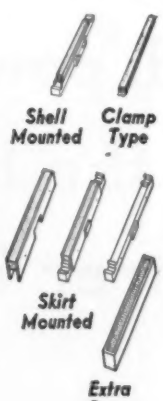

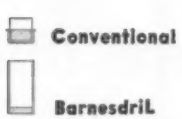

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Walter C Hecker has retired as president and director of Curtis Manufacturing Co, St Louis, Mo.

Albin M Degner, works manager of Surface Combustion Corp, Toledo, Ohio, has retired after 45 years of service with the company.

Murray J Granger, formerly metallurgical engineer at Aerojet-General, Azusa, Calif, has been named plant manager of a new branch of Wall Colmonoy Corp's Stainless Processing Division in Montebello, Calif.

Norman D Jesse, manager of the eastern branch of Byron Jackson Co's (Los Angeles) Pump Division, New York, has been elected vice president of sales, service, and branches of the division. **Garth F Nicholson,** general manager of the Oil Tool Division has been named vice president there.

A B Dick Co, Chicago manufacturer of duplicating equipment, promotes: **H R Mick, Jr,** to general superintendent of manufacturing; **J A Lukas,** manager of quality control, to superintendent of equipment; and **H S Hurwitz,** plant chemist, to succeed Mr Lukas.

James G Richmond, assistant manager of manufacturing, Indiana Steel Products Co, Valparaiso, Ind, has been promoted to manager of manufacturing.

John L Strauchon has joined the project-sales engineering staff of Tenney Engineering, Inc, of Union, NJ.

R K Rawlins, a member of the Chicago sales staff of Lindberg Engineering Co (Chicago) has been appointed district manager with offices in Dallas, and will direct sales activities in the Texas-Louisiana area. He succeeds **William A Hammer,** who has resigned to join Dominy Heat Treating Corp, Dallas.

M D Lackey has been named chief product engineer for Unit Rig & Equipment Co, Tulsa, Okla.

Carl A Eversman, vice president of Mullins Manufacturing Corp, Warren, Ohio, has been named manager of the company's Salem, Ohio, plants.

Clark L Burget, Jr, formerly a machine tool buyer for Ford Motor Co, has joined the Barnes Drill Co, Rockford, Ill, as sales engineer in the Detroit office.

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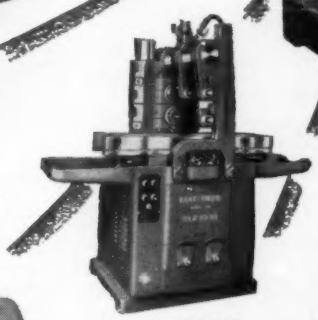

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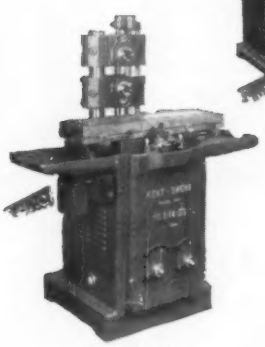

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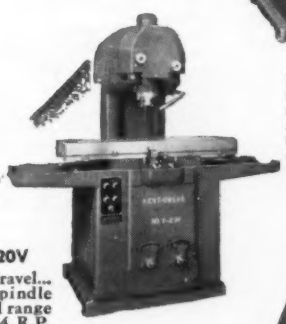

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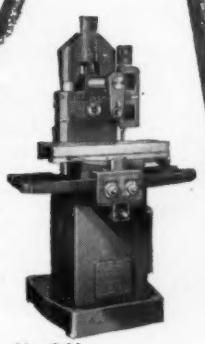

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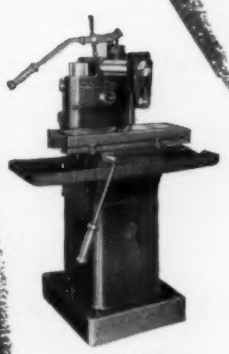

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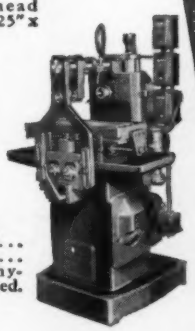

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Noland Co., Inc.
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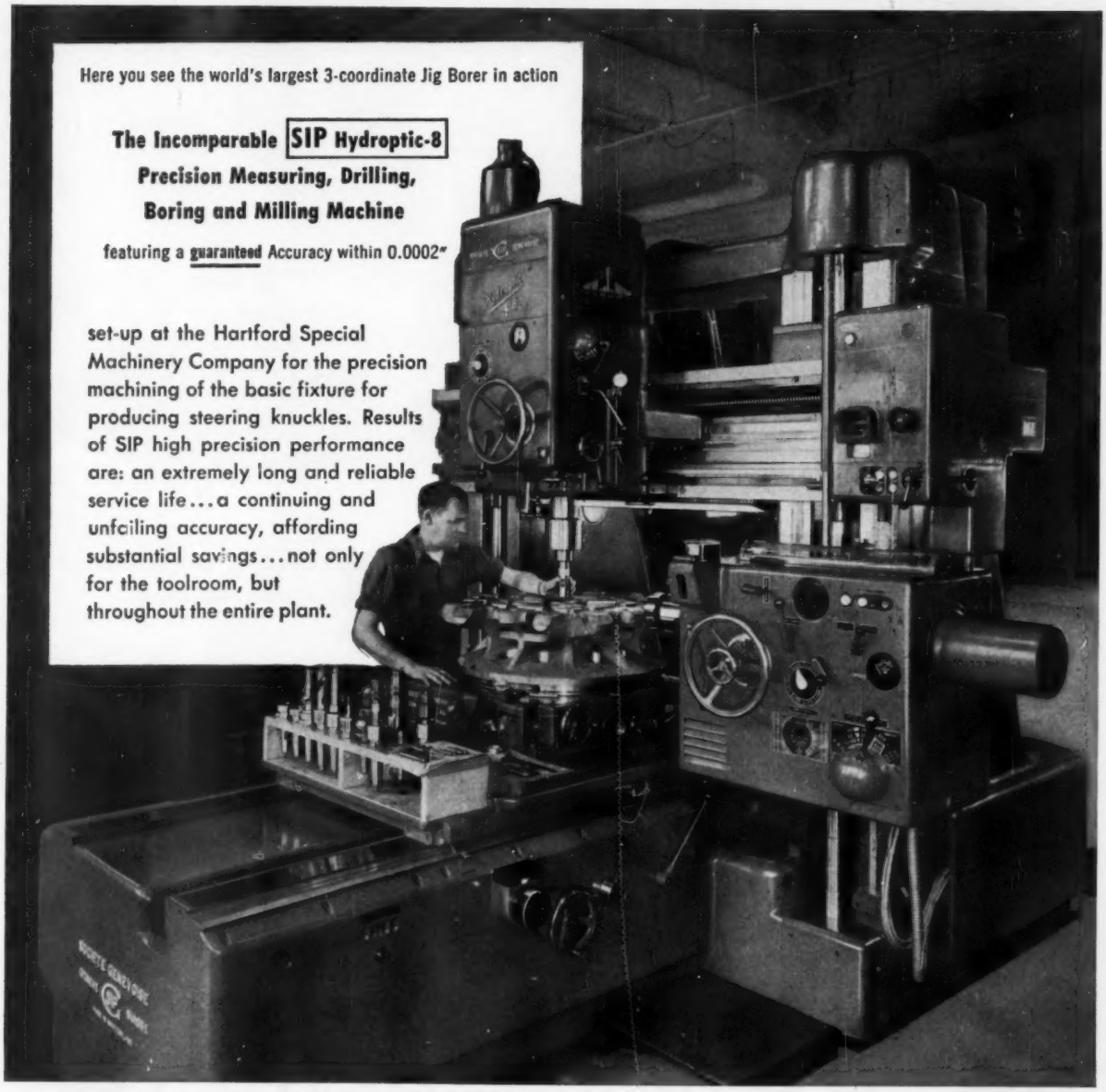

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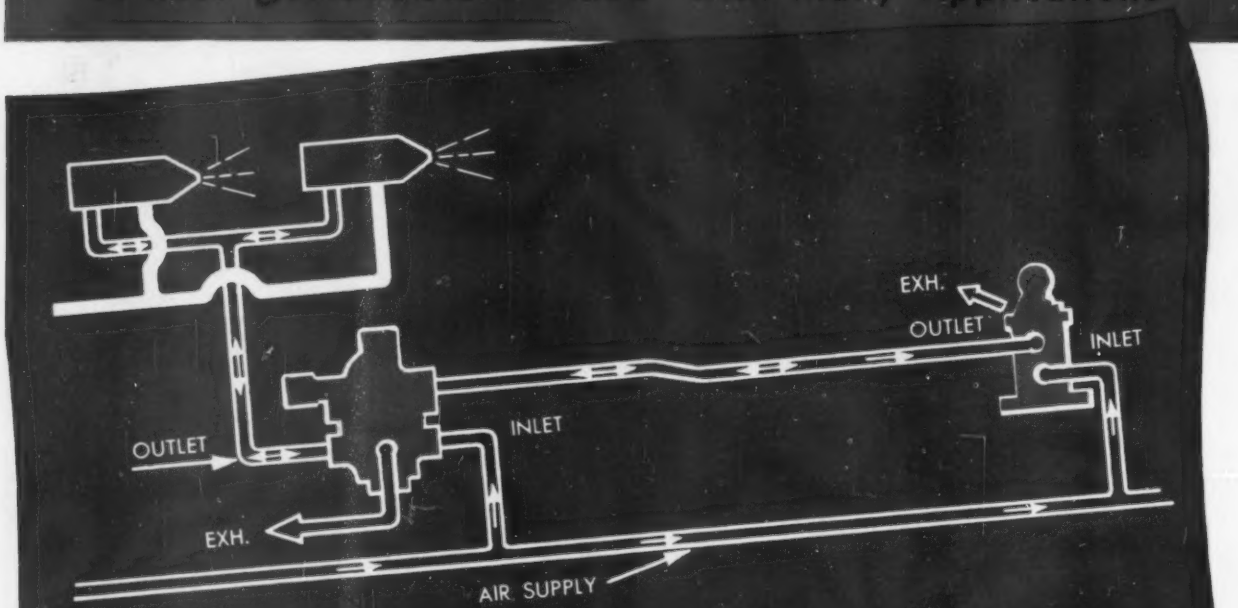
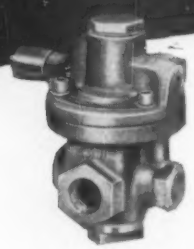


Sprays drawing compound with every press operation



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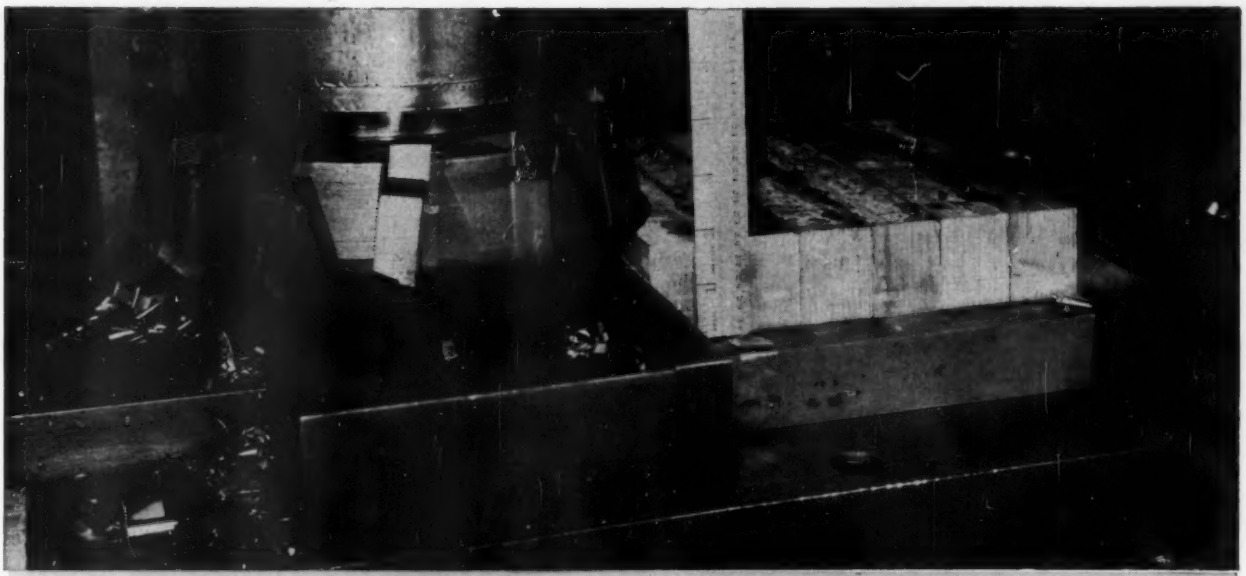

DETAILS OF JOB ILLUSTRATED

Machine	Sundstrand Rigid Mill
Cutter Size	10" Diameter
No. of Teeth	12
Carbide Inserts (grade)	Carmet CA-610
Rate of Travel	400 S.F.P.M.
Table Speed	10 in. per minute
Depth of Cut	½ inch
Material	1095 Cold Drawn Shank Steel, 200 Brinell

READY FOR YOU

Complete Technical and Shop Data on the Carmet "CA-600 Series" of special steel-cutting Carbides

Write for Your Copy

ADDRESS DEPT. AM-64

Here's something *special* for you: the new Carmet steel-cutting grades of carbide, called the "CA-600 Series." One of the grades is shown above in a milling operation—a tough job where the major requirement was continuous production. Cutters equipped with Carmet CA-610 inserts not only increased the production of the machine on this job, but actually gave 50% longer life than the comparable cutting materials previously used.

These heavy-duty CA-600 Carmet grades (premium products in performance, *at no premium in price*) have been thoroughly job-proved in the field. They're available to fit *your* steel-cutting requirements . . . *let us arrange a demonstration of their ability to save time and money for you.* Get in touch with your nearest A-L representative or distributor, or address *Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Michigan.*

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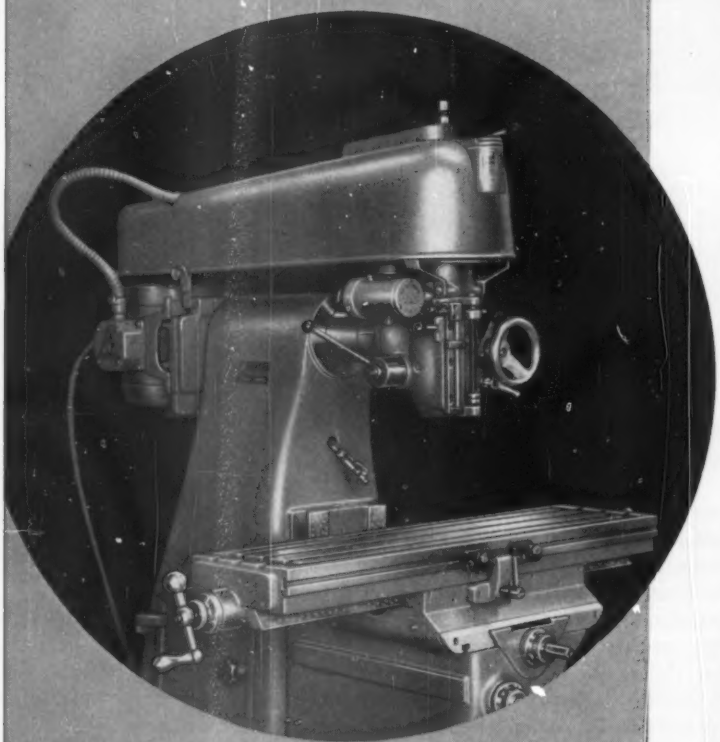
MORE easily

new POWER FEED HEAD

U. S. Vertical Miller



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Here's the new U. S. Vertical Miller with Power Feed Head – the head into which U. S. has built all the most wanted features without sacrificing traditional U. S. simplicity. Check its infinitely variable feed rate, its 800 pounds of down thrust on the quill, its supplemental hand feeds – it is the milling head that was designed to meet all shop needs.

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more versatile
Feed infinitely variable from .002" to .008" while in operation

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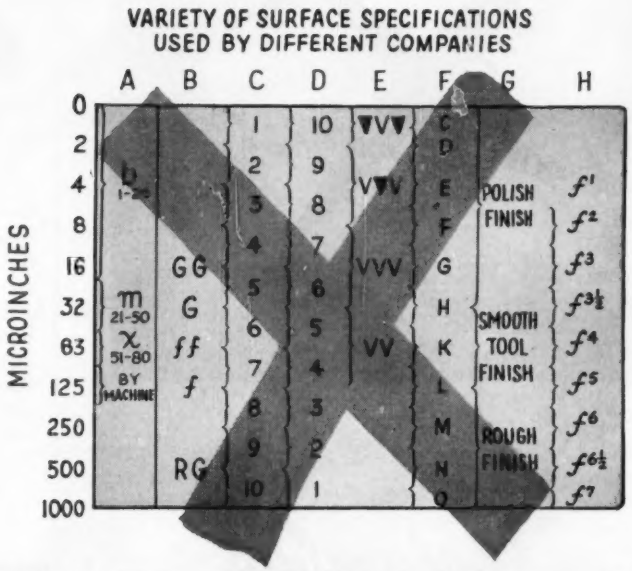

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PRECISE
hole location, easy contour inspection with *new* machine tool microscope

Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

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Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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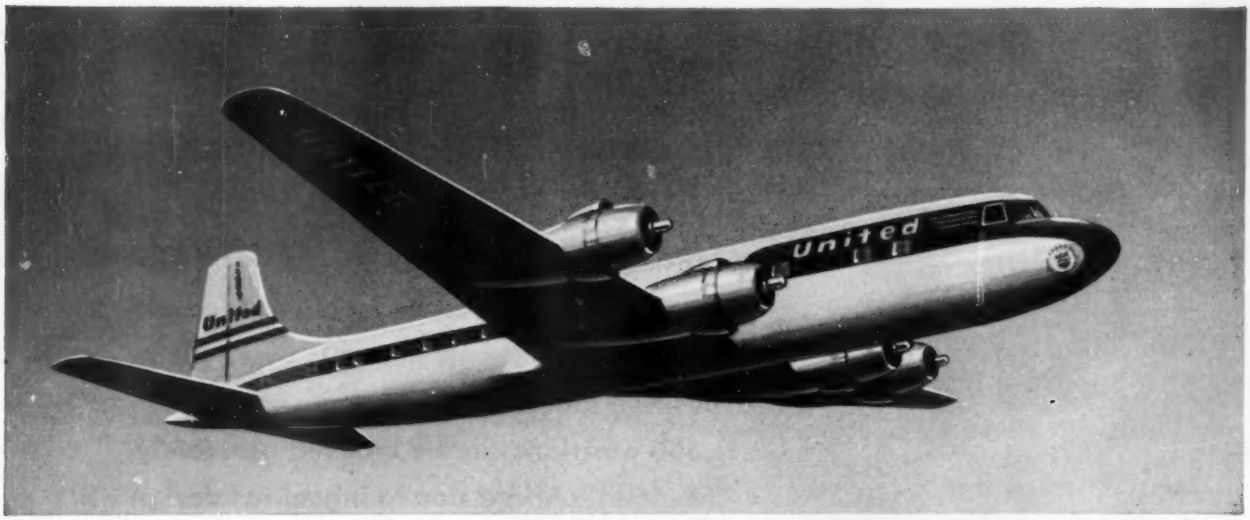

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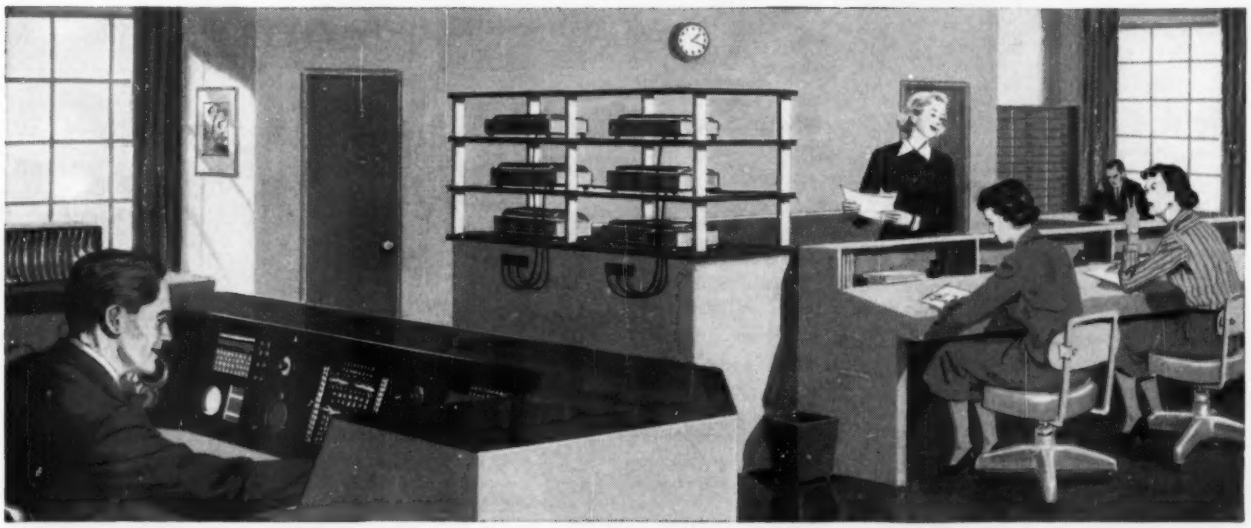

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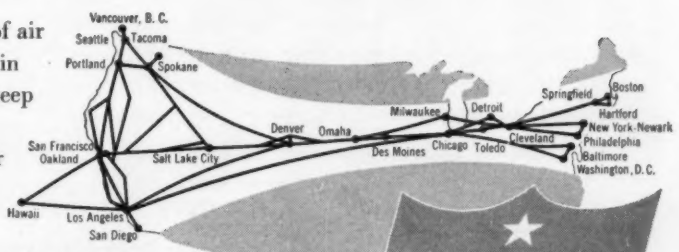

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EXCLUSIVE ERICKSON INDEXER FEATURES:

- Index mechanically locked by spring-loaded pin
- Integral shock control unit prevents over-ride
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- Up to 500 positions can be indexed accurately
- Reasonably priced due to ingenious design
- Index plate is easily changed
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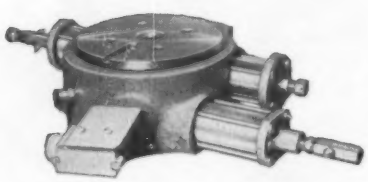
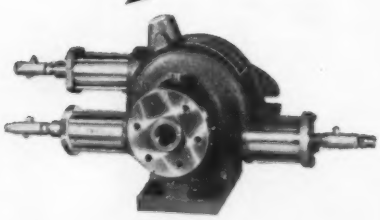
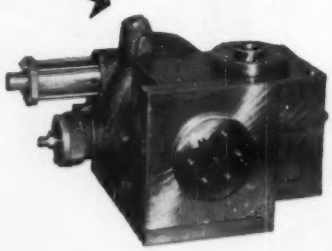
- Operates by air or hydraulics



MODEL 450 ERICKSON SPEED INDEXER is designed for vertical operation. Extra large drive spindle rides on Timken roller bearings at top and bottom of spindle and permits handling of larger and heavier work. This model is suggested for installations where limited height is a factor.



MODELS 400 and 600 ERICKSON SPEED INDEXERS Standard index plate provides 4, 6, 8, 12 and 24 positions. Special indexing parts are available to provide up to 100 positions. Two mounting surfaces provide for vertical or horizontal mounting.



MODEL 477 ERICKSON MULTIPLE POSITION INDEXER accurately indexes up to 500 positions, depending on the gear ratio and index plate employed. Since gear box turns on indexer spindle, unit can be operated in any angle from 0 to 90°. Units are made to customers' requirements.

You can speed up and simplify accurate positioning with Erickson Speed Indexers. For fully automatic operation interlock them in your production line by use of micro switches and solenoid valves. They are designed for single or continuous cycle operation.

All Erickson Indexers feature an adjustable, self-contained shock control unit that assures positive, fast indexing even under heavy load. Maximum speed can be used with no over-ride.

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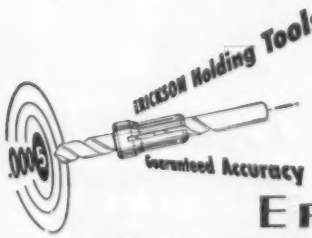

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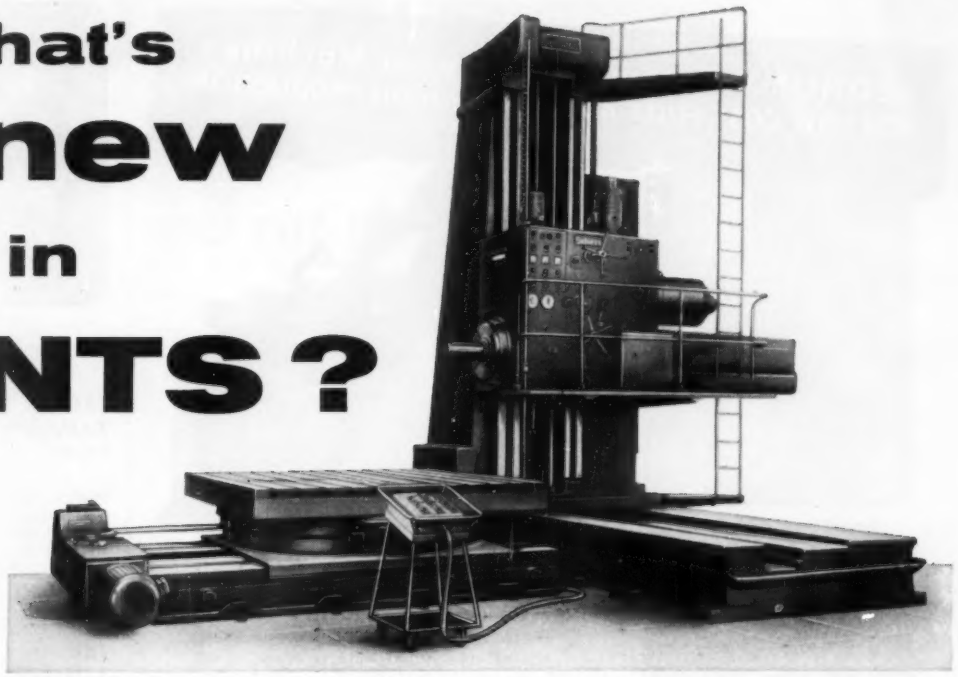

This 8⅞" SCHIESS model BF horizontal boring and milling machine . . . Now completely redesigned with many innovations. Here are a few . . .

Two individual drives—gear-drive for roughing, belt-drive for finishing. Belt-drive particularly suited to high-speed machining with carbide tools. New tool clamping device—does away with draw keys, hammers, drifts and binding screws. All spindle-slide movements controlled from easily accessible operating platform (or from pendant station or portable control panel, if desired). Special main-drive belt requires no readjusting. Column, spindle-slide and boring spindle may be adjusted at rapid traverse.

Spindle diameters, 6 5/16" to 8⅞". Maximum diameter bored, 59"—faced, 79".

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This 23 ft. SCHIESS model K vertical boring mill . . .

Look at all these new features—each one a time-saver! Rapid traverse motions with pushbutton control of changeover from feed motion to independent power traverse. Electro-mechanical locking of cross-rail to columns. Fingertip speed control—counter-balanced cross-rail and side-head—completely enclosed swiveling octagon rams—pendant control—automatic lubrication.

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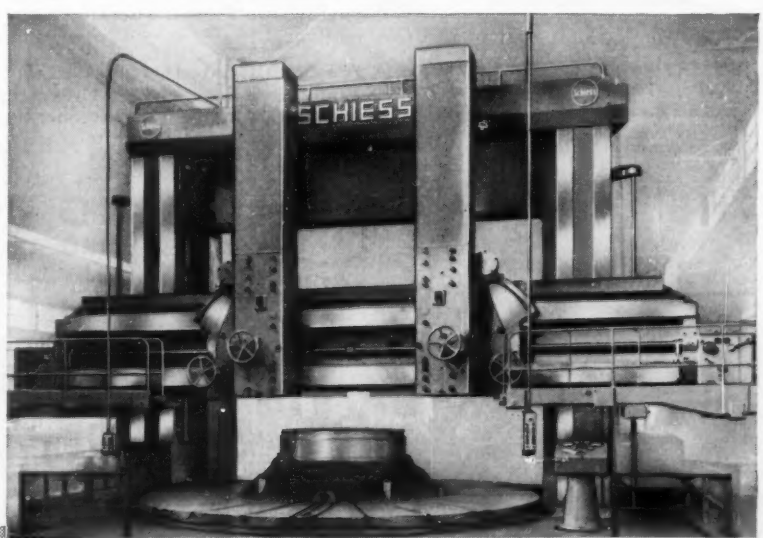

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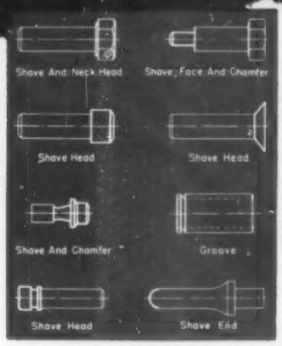
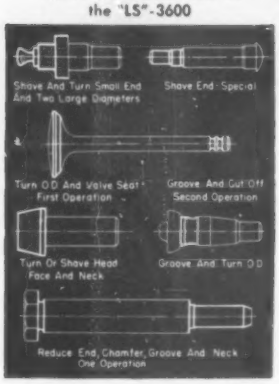


Typical parts machined on the "LS"-3600


Shave And Turn Small End And Two Large Diameters
Shave End Special
Turn O.D. And Valve Seat First Operation
Groove And Cut Off Second Operation
Turn Or Shave Head Face And Neck
Groove And Turn O.D.
Reduce End, Chamfer, Groove And Neck One Operation

Illustrating operations completed on the S-4300

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They are available in two sizes—the "LS"-3600 for body diameters up to 1/2" and lengths under heads from 1/2" through 4-1/2"—the S-4300 for body diameters up to 1" and lengths 3/4" to 6" under heads. Production rates for the standard "LS"-3600 range from 800 to 2400 finished parts per hour and the S-4300 from 450 to 1800 per hour.

Machines are fully automatic and parts flow from hopper to work pan. Simple adjustments plus easy, rapid set-ups enable operator to operate several machines.

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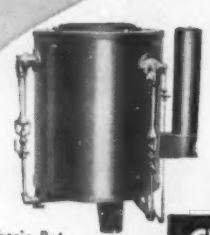

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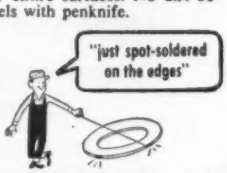
Made up of from 3 to 63 layers of .002 or .003 inch brass or steel, metallically bonded together over their entire surfaces. No dirt between layers. Peels with penknife.

THE LAMISOL® SHIM



FOR QUICK, ASSEMBLY LINE USE
The laminations of the LAMISOL® Shim (in brass only) are temporarily joined by spot-soldering on the edges. Gauges and number of laminations within one shim are unlimited.

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FOR SUPER SPEED, THIN GAUGE SITUATIONS
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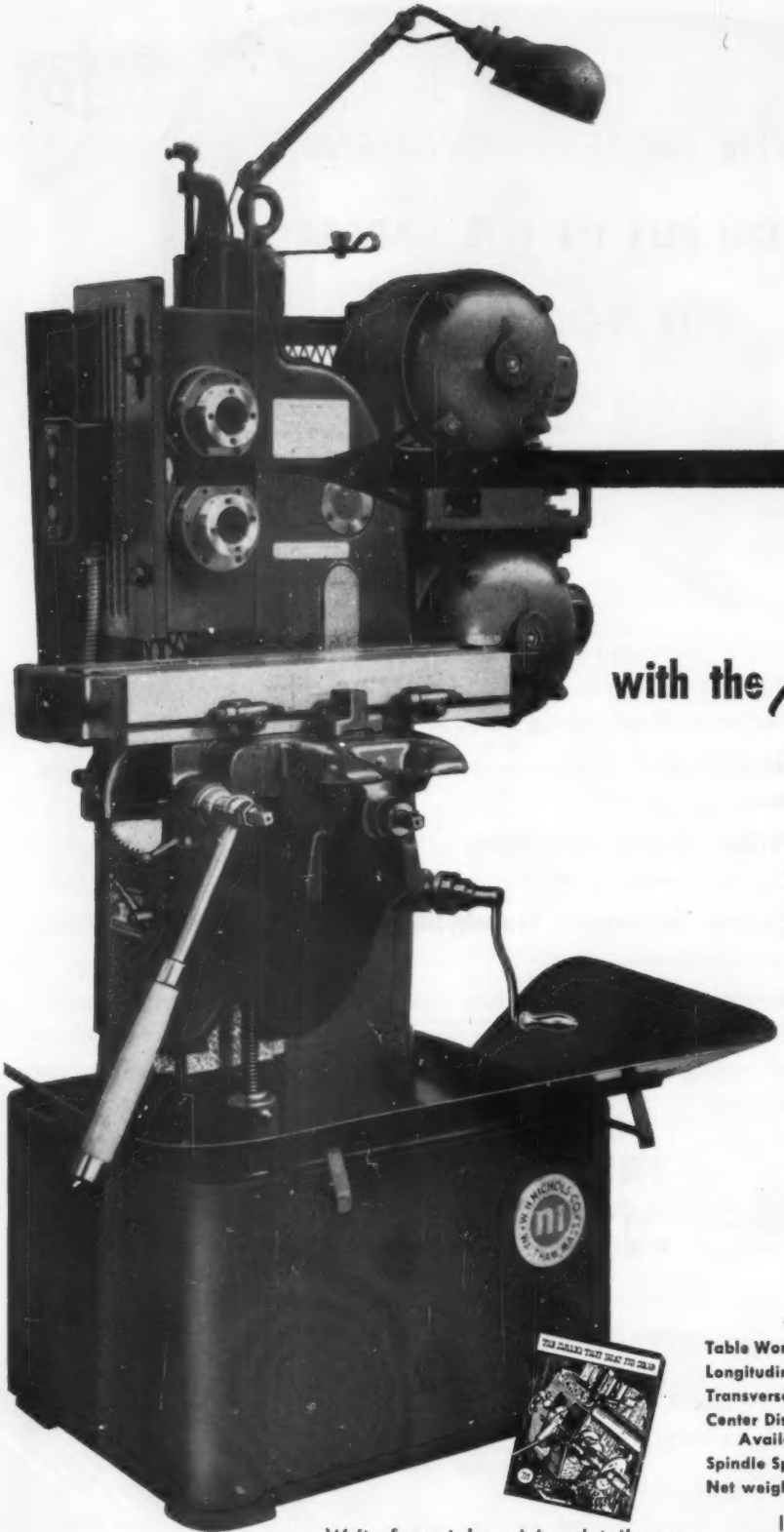

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Longitudinal Travel	10"
Transverse Travel	7"
Center Distance of Spindles Available Between	3¾" and 14⅜"
Spindle Speeds Available	up to 5000 R.P.M.
Net weight approx.	1250 lbs.

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If you're interested in increasing output...and... cutting costs--why not get ALL the details on the new Holmes Combination Hydraulic Forcing and Straightening Press? Write for Specifications Manual--TODAY. It's yours for the asking--with no obligation whatever.

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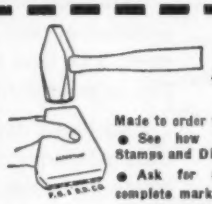

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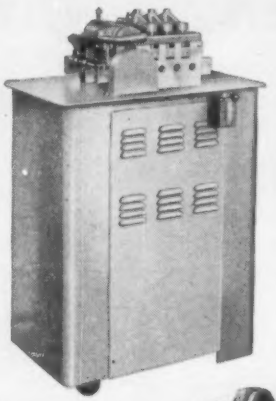

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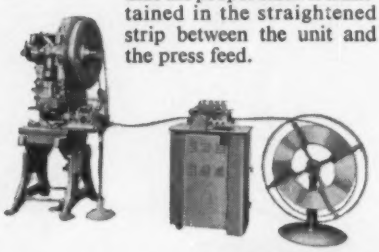
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars
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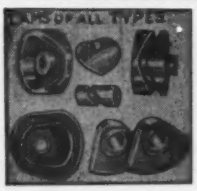
Production Feeding Equipment



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Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 738 Union Ave., Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

Why you should use the Jig Borer and Jig Grinder to inspect their own work

In more than 90 per cent of all cases, the Moore Jig Borer and Jig Grinder provide the most accurate and efficient means for inspecting their own work. The advantages include:

1. Considerable saving of time results from checking the piece in the original setup, *while still in the machine.* In addition, should an error be discovered—the work is *in position* for correction.

2. The same directness which reduced sources of locational error in comparison to toolmaker error also reduces the number of steps and sources of error in inspection.

3. The machine's measuring system is fully as accurate as *any* standard that might be used in its stead. The inspection values, determined by means of this system, are likely to be *more* accurate than those attained by any other shop standard because reorientation errors are eliminated.

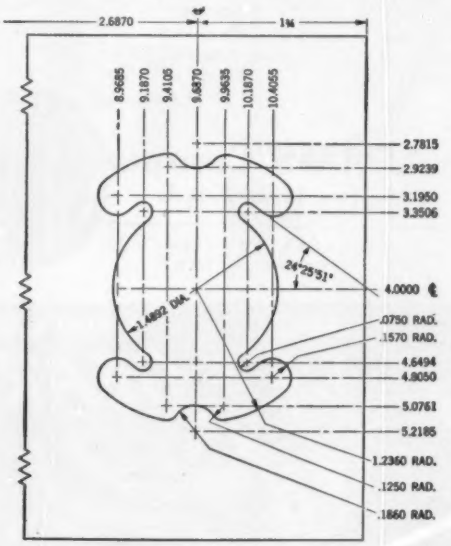
4. The machine spindle provides a rotatable mounting for an indicator. Holes can be picked up directly in this manner, without use of plugs or pins. Out-of-roundness, often mistaken for out-of-location, is easily detected and identified. Full 360° rotation of spindle provides a double indicator reading of any error, thus increasing readability. By vertical movement of the spindle and indicator the shape of the hole can be explored, revealing taper, bellmouth or barrel shape.

5. Contours, one of the most difficult, time-consuming jobs of inspection, can be rapidly and accurately measured and inspected by use of the "indicator measuring" technique. The drawing at the right shows dimensions to be inspected on a complex contour. Of this job it might well be said, "How *else* would you inspect it?"

6. Work jig bored or jig ground to *polar* coordinates on the rotary table can be inspected to *rectangular* coordinates in the same setup. This not only provides a check on possible errors in settings; it eliminates sources of rotary table errors.

7. Paradoxically, the machines will actually inspect somewhat more accurately than they will locate, under most conditions. During inspection, both machine and work are free of vibration, stresses and temperature differentials, so that the accuracy of the measuring system is undiminished.

8. A microscope, interchangeable with the indicator in the machine spindle, can pick up surfaces and small holes which cannot be conveniently reached with an indicator point.



Without modern methods, this contour presents a serious problem to inspect as well as to machine.

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The information on this page is just a sample of the valuable, on-the-job aid you can get from Moore's *all-new* book, HOLES, CONTOURS AND SURFACES. Tells you how to produce tools, dies and precision parts *the modern way.* 424 pages, 495 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Price only $5 in U.S.A., $6 elsewhere. Send check or money order to Moore Special Tool Co., Inc., 738 Union Ave., Bridgeport 7, Conn.

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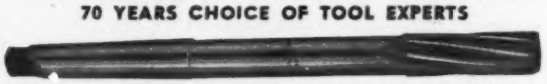

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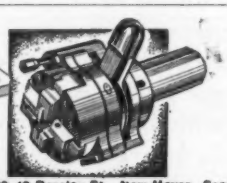

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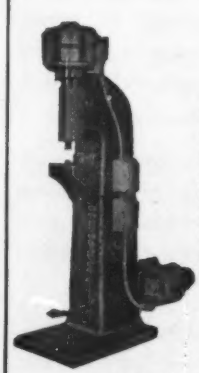

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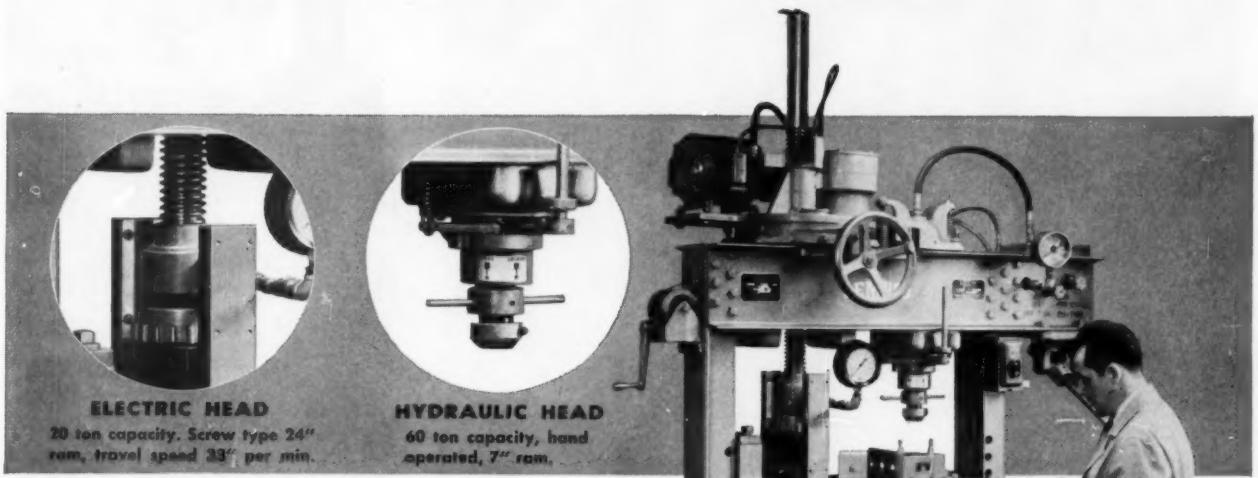
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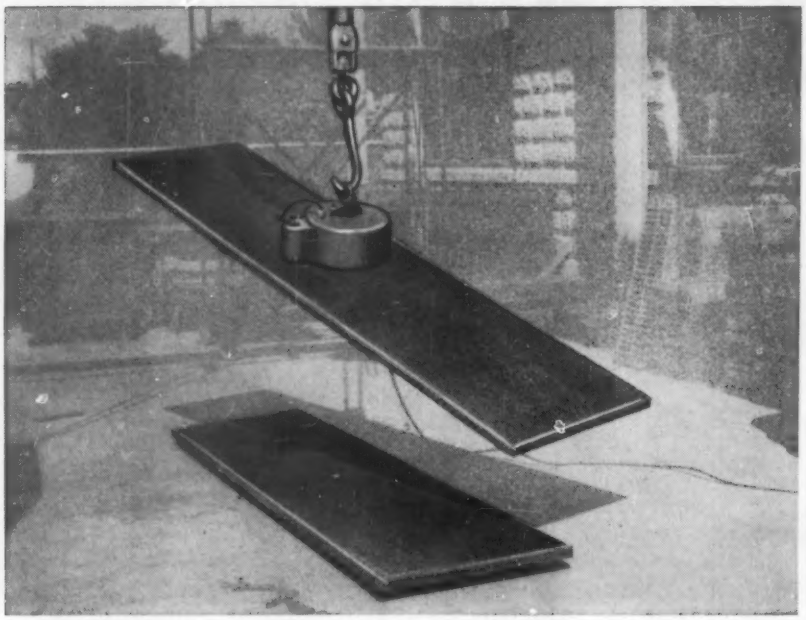

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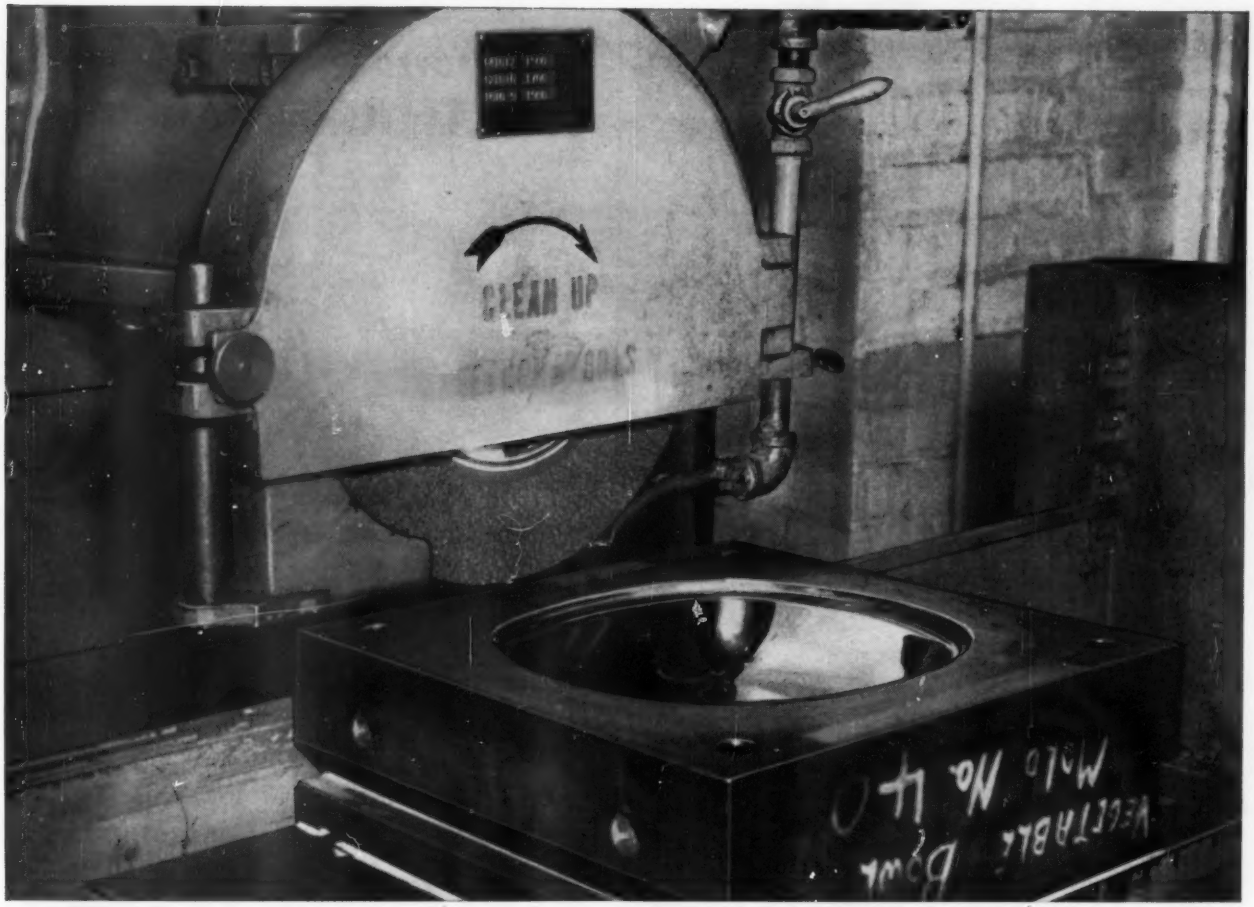

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ENDURO TOOL AND ENGINEERING COMPANY, CHICAGO, made the mold for this plastic vegetable bowl which is produced for Sears, Roebuck & Company by Plastic Masters, Inc., New Buffalo, Michigan.

To insure removing stock quickly yet accurately, the mold, measuring 14" x 13½" x 4½" and made of CSM-2 crucible steel, was ground on a Covel No. 60 Hydraulic Feed High Speed Surface Grinder.

Enduro selected the Covel No. 60 for its speed, accuracy, capacity to handle dies and molds of varying sizes and because floor space is at a premium. These are among the many reasons why Covel Hydraulic Feed Surface Grinders are "standard equipment" wherever speed, precision, capacity with compactness—and dependability—are "musts." It will pay you, too, to standardize on Covels. Send for details — ask for Bulletin AM 95.

COVEL NO. 60 HYDRAULIC FEED SURFACE GRINDER
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Grinding wheel, 14" x 1" x 3".
Spindle motor, 3 H.P.
Available with or without wet grinding attachment.

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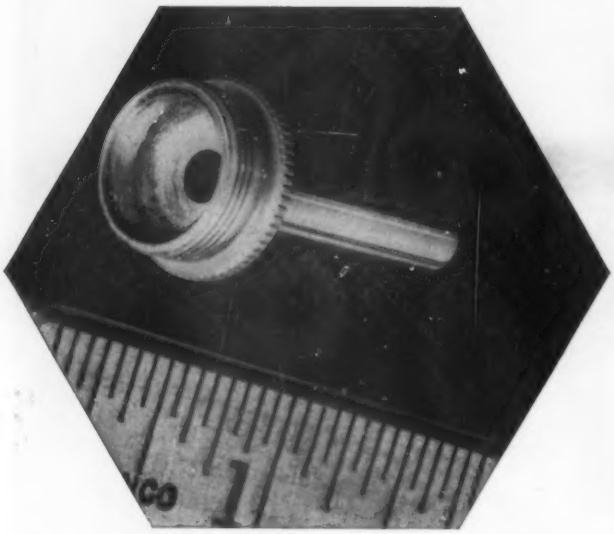
There is a right way to thread and tap this aluminum part



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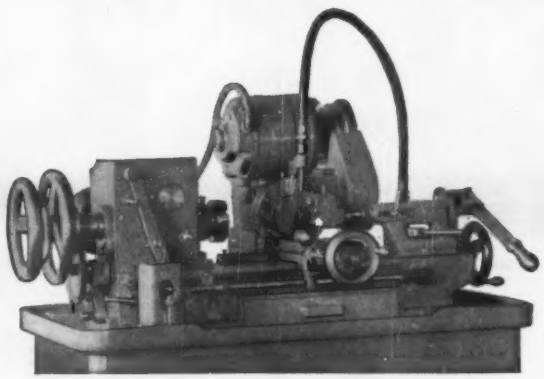

Design improvements have recently been embodied in these machines. Some are included with the standard equipment for miscellaneous work, some for production, and some for both. Send drawings or samples giving all dimensions and production needed and perhaps we can help by advice or quotation.

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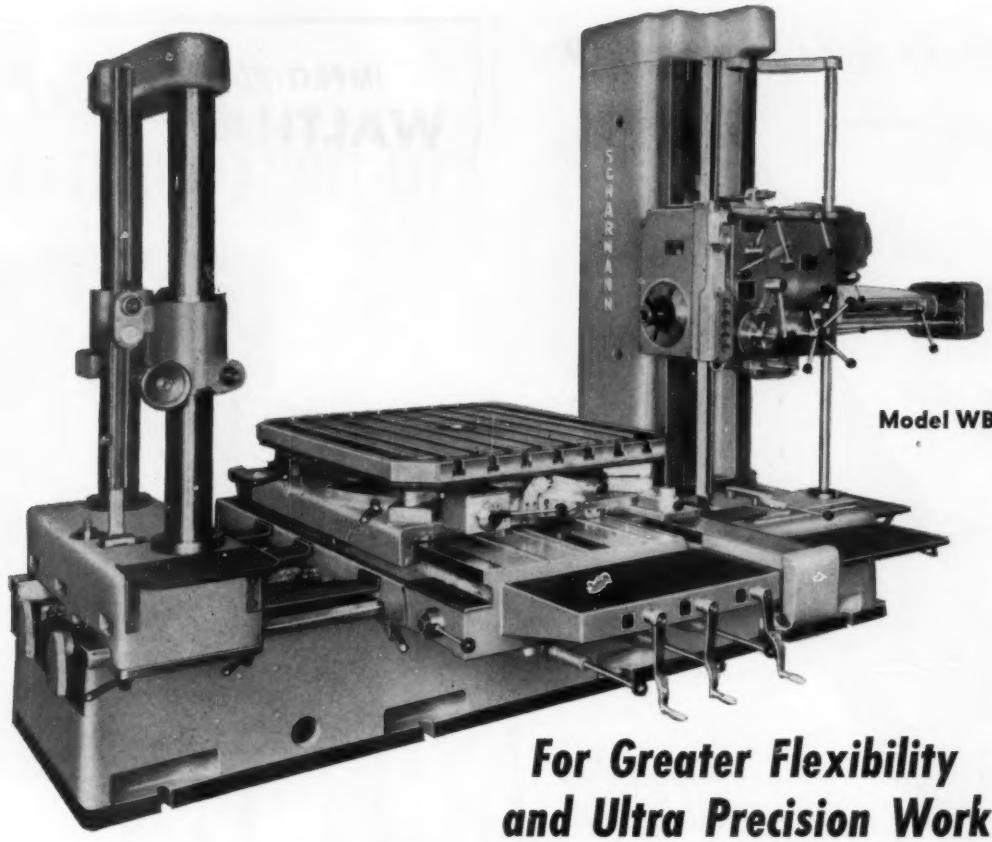

Model WB-80

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The Scharmann WB-80 Table Type, Horizontal Boring, Drilling and Milling Machine was developed to give users broader machining possibilities than with other comparable machines of the same size and type.

The main drive motor is mounted on the head stock and boring spindle is rotated by means of two bronze keys set in splines in the spindle sleeve thus eliminating gear pressure on the spindle. The feed pressure to the spindle is applied through back gears to the leadscrew which is concentric in the boring spindle. Axial pressure is taken up by thrust bearings. This construction is exclusive to Scharmann Boring Machines, and eliminates necessity for bevel gearing. It also eliminates back-lash, provides maximum motor power to spindle drive and assures consistently accurate production to close tolerances.

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Full descriptive bulletins covering this and other models available upon request.

See this Scharmann Boring Machine at the Canadian International Trade Fair in Toronto May 30th to June 10th, 1955. Stop in at Booths 3806 & 3807 in Building 3E.

OTHER ADVANCED DESIGN FEATURES

Face plate independently mounted on its own bearing eliminates accumulated error.

Automatic knock-off for all movements set from large, easy to read dial.

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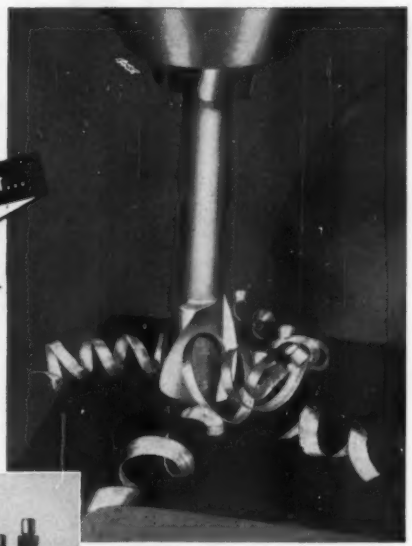
WELDON "TU-LIP" COUNTERBORES



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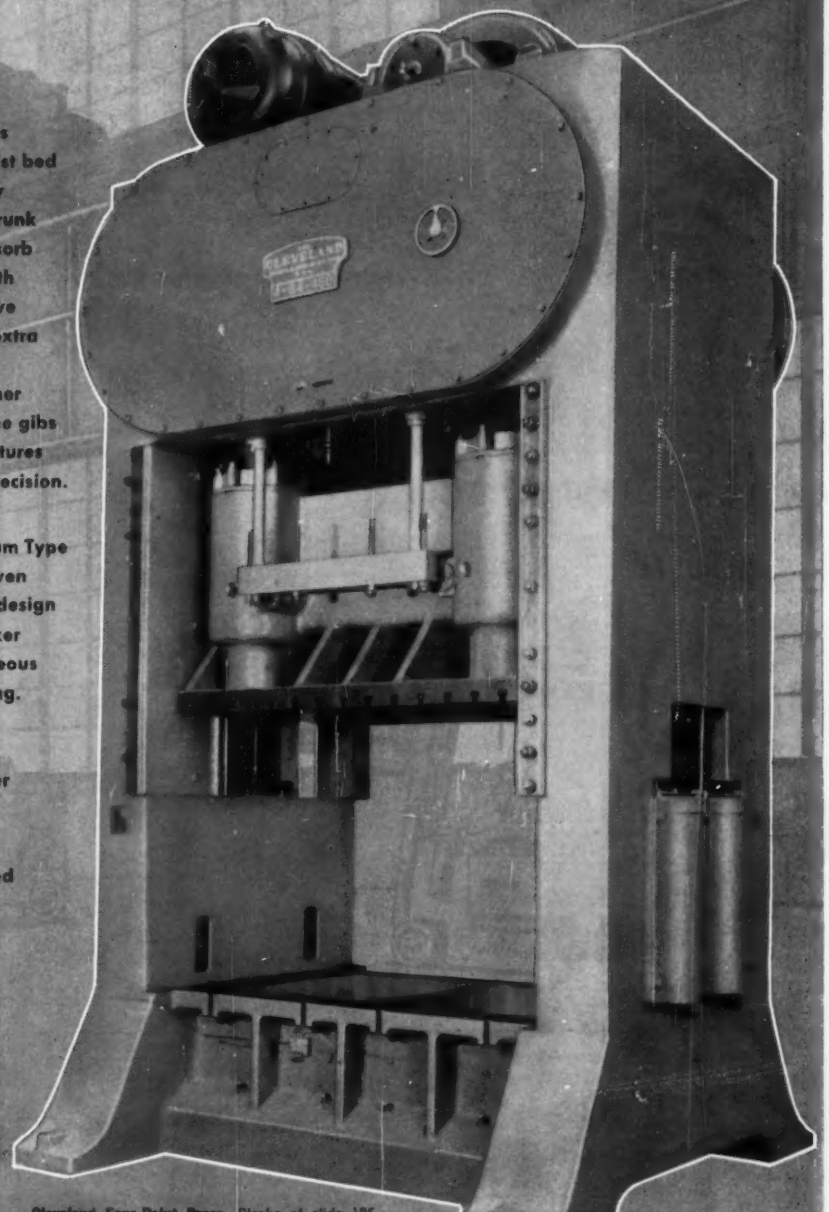

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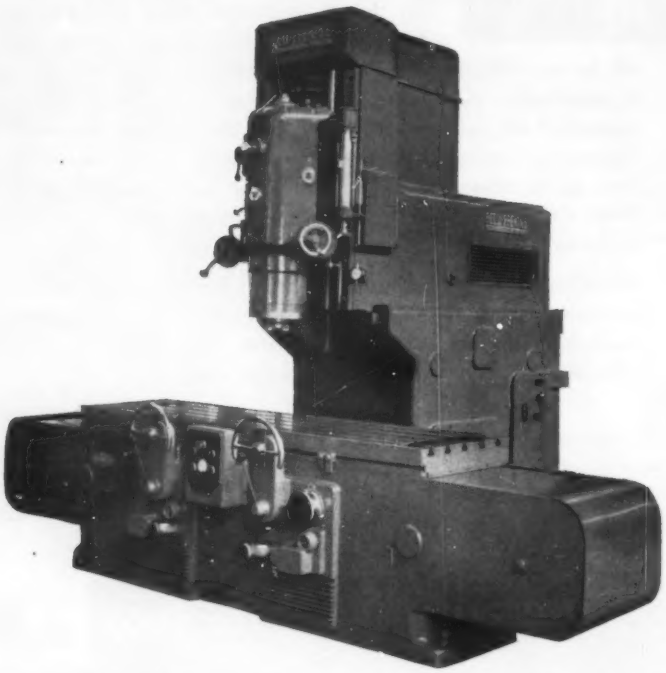

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NORTON: 12"x18" TYPE C Universal
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HEALD: #72A3 Plain & Sizematic
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LANDIS: 2½" Single head horiz. Threading
LEES BRADNER: #40A Thread Miller
LEES BRADNER: CT-36 Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. cap.
PRATT & WHITNEY: 4½x12" Thread Miller

MISCELLANEOUS
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HARDNESS TESTER: Gagan Brinell 16-8
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SUNDSTRAND: Double End #53 42" & 60" Centerline Machines
HEALD #22 Rotary Surface Grinder
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CLEVELAND 5¾" single spindle; late type
CONOMATIC 1⅞", 8-spindle; M.D., late type
NEW BRITAIN GRIDLEY Model 665; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal
NILES 8" bar; floor type; motor drive
HEALD 48A single end Boremat ic; M.D.
HEALD No. 45, 49 double end Boremat ic; M.D.
LUCAS #42 Precision Boring Milling & Drilling Machine
UNIVERSAL "TRI-WAY" 3" bar, M.D., late

BORING MILLS—Vertical
BULLARD 8", 8-spindle & 16" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 24" spiral drive; PRT; late type
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
CINCINNATI I-30 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late
COLONIAL VGI-10-48 Vertical; Hydraulic; late type
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Manufacturing
AVEY #2—2 spindle high speed, motor drive, late
BARNES #262 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
CLEVELAND "A" 5¾" single spindle; late type
LELAND-GIFFORD 1LMS, 4-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 2-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 4-spindle, M.D.; late
NATCO B-4-B "Hole Steel" 60 adj. spindles; late
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO E-5 high speed, 10 adj. spindles; late

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 48 High Speed Gear Shaper; internal cap. 72" diameter; late type
FELLOWS No. 6IA & 6I5A High Speed Gear Shaper
FELLOWS No. 672 High Speed Gear Shaper; late
FELLOWS No. 7A, No. 72 and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late
FELLOWS 20-M Red Liner; New 1954
FELLOWS 24-M Involute Measuring Machine; 1954

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 13 Hyp. Cutter Sharp; latest type
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late type
GLEASON No. 14 Spiral Bevel Hyp. Gear Grinder
GLEASON #16 Hypoid Gear Generator, motor drive.
GLEASON No. 17 Spiral Bevel, Zerol and Hypoid Gear Grinder, M.D., late type
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Tester; latest type
GLEASON #22 Hypoid Formate Gear Finisher; late
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 37" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
BROWN & SHARPE #3 Univ. motor drive, late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 6"x18" Mod ER Plain, "Filmatic"; late
CINCINNATI #2 Centerless, Model EA Filmatic; late
LANDIS 20"x144" Plain Cyl. gap type, M.D., late
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 10"x36" type DC plain hydr. with infeed; late
LANDIS 16"x36" type "C" Universal, M.D. late
LANDIS 20"x144" Plain Gap Grinder; late type
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type
NORTON 16"x72" Type "C" Plain; late type

GRINDERS—Internal
BRYANT #5 Internal, hydraulic, late type
BRYANT #16-C-16 Internal, Hydraulic, late
BRYANT #24—36" Internal, hydraulic
HEALD #70A Internal, motor drive, late type
HEALD #78 Centerless; motor drive; late
HEALD #81 pl. chuck type, hydraulic; New 1947

LATHES, Turret
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late
WARNER & SWASEY #2 Geared Head; late type

LATHES, Engine & Mfg.
AMERICAN 16"x102" centers, "Pacemaker"; late type
GISHOLT #12 Hydraulic Automatic; motor drive; late
HENDEY 24"x36" centers; motor drive; late type
HENDEY 16"x72" centers Yoke Head, M.D., late type
LeBLOND 20"x48" centers, Timken; M.D., late type
LeBLOND 42"x108" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
MONARCH 16"x54" Centers, Motor Drive
MONARCH 16"x78" centers, Model CW, Timken, late
MONARCH 16"x78" c.c. Model CW; Timken; late type
MONARCH 20" (raise to 3½") x 144" c.c., late type
NILES 30"x50' bed, single and boring, "Time Saver"
NILES 30"x100" c.c. Geared Head; Timken; late
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SPRINGFIELD 20"x40" c.c., motor drive; late type
SUNDSTRAND 10"x60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHARPE #2 M.D. late type
BROWN & SHAPPE #10, motor drive; late type
CINCINNATI I-18 Production; Timken; late type

MILLING MACHINES, Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x36" and 6"x72"; #HT 12"x24" and #HT 12"x30" centers; late type
MOREY 12"x30" and 12"x160" centers; late type

MILLING MACHINES, Vertical
CINCINNATI #4 High Speed Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
CINCINNATI #3 Dial Type; High Speed, New 1953
KEARNEY & TRECKER 3K late

PLANERS
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
LIBERTY 144"x76"x48' adj. openside; box table; 4 hds; vari-voltage; PRT; New 1940
NILES-BEMENT-POND 72"x72"x30'; 4 hds; PRT; DC; M.D.

PRESSES
AVEY No. 2, 2-spindle Drill Press; late type
BLISS #410A, 825-ton double action toggle drawing press; M.D.
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
SHAW 250-ton Hydraulic flanging press; late type
WATERBURY FARREL #9, 125-ton cap., M.D.

SHAPERS
CINCINNATI 20"; motor drive; late type
GOULD & EBERHARDT 32"; High Speed; M.D.
HENDEY 12" High Speed Univ. Crank Shaper; late
MOREY 8" Vertical; motor drive; late type
ROCKFORD 24", hydraulic motor drive; late type.

MISCELLANEOUS
ALEXANDER #2, 3-dim. Engraving NEW 1952
BARNES No. 172 Honing; M.D., hydr.; late type
HILLES & JONES #7 Plate Bending Roll; capacity 7/8" x 16"; motor drive
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36" Rogers vert. T/L side head, new 1942

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4' arm 13" col. Fosdick Economax, new 1941.
4' arm 13" col. Carlton M.O.B.
9 ft. arm 16" column American, late type

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4"x18" Cincinnati pl. hyd., plunge cut, 1946
6"x18" Landis "C", 30 deg. head, 1941
10"x18" Cincinnati Ilmatic, type ER (2), 1941-1946
12"x36" Cincinnati ER Univ. cylindrical, new 1941.
14" Standard Electric twin-wheel carbide grinder, late.
14"x36" Landis type C, hydraulic (2), 1946
16" 26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16193
12" Model 22 Heald rotary surface, 1942
16A2 Blanchard rotary surface, serial 6046, 1946
14"x36" Pratt & Whitney vertical surface grinder, 1942
72" No. 72 Hanchett rotary surface, 1946

LATHES, ENGINE

10"x18" Hendey toolroom, serial 29620
12"x30" Monarch model C, ser. CK16407, 1942
24"x48" Monarch toolroom, serial CK-14677, 1942
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17"x72" LeBlond Rapid production (5), 1948-1947
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

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No. 4 Cincinnati Hi-power plain horizontal
No. 5 Cincinnati Hi-power plain horiz., vert. attach.
No. 4-36 and 4-48 Cincinnati Hydromatic production
No. 3B and 4K Kearney & Trecker plain, late type
No. 3B Brown & Sharpe plain horizontal, new 1942
No. 3K Kearney & Trecker universal dial type.
No. 3H Kearney & Trecker plain horiz., new 1942.
Nos. 1-18 and 2-18 Cincinnati prod., late

PRESSES

600 Ton No. 90-600 Minster K-J Coining, new 1941.
500 Ton Baldwin Southwark Hyspeed Hydraulic 1939
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150 ton No. 13-1 Cleveland O.B.I. late type
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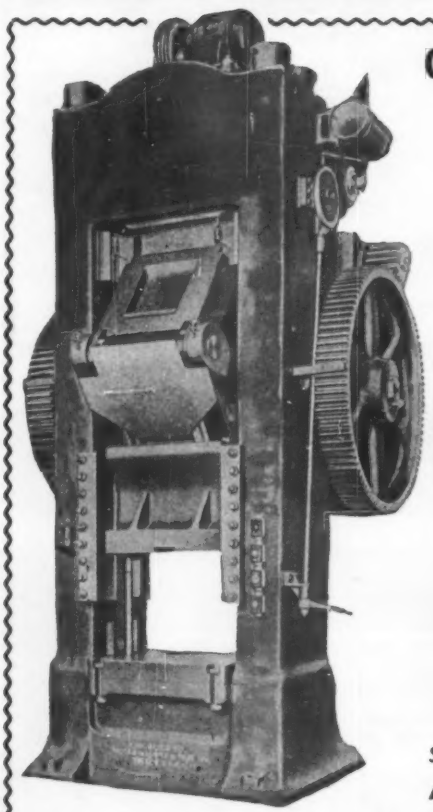

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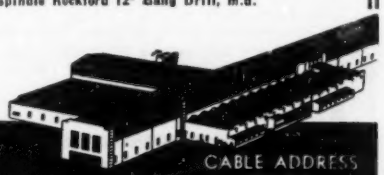

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No. 3 Avey—2 spdl.—24" sw.
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No. 2 LMS L-G—4 spdl.—14" sw.
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No. 65 Fellows, Cone Drive
No. 12HS Gould & Eberhardt

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No. 74 Heald Int. Centerless
No. 72-A Heald Univ. Int.
No. 72A5 Heald Int. (1942)
No. 5 Bryant Internal
No. 5A Bryant Hole & Face
No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16-28 Bryant Internal
No. 16A16 Bryant
No. 16A-28 Bryant Internal
No. 16F-28 Bryant Internal
No. 16-38 Bryant Internal
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No. 24-36 Bryant Internal
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16"x33" R-14 Seneca Falls
16 ML 16 LeBlonde Semi-Auto.
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27"x84" cc American Geared Hd.
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No. 2 Warner & Swasey Elec. Hd.
No. 5W Acme Universal
No. 6 Warner & Swasey, bar fd.
No. 7A Jones & Lamson
No. 2A Warner & Swasey
3A Warner & Swasey Turret (1942)
No. 3AL Gisholt Cross Slide
No. 3H-16 Libby International
No. 3A Warner & Swasey Turret Lathe
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)

MILLING MACHINES

No. 2HL K. & T. Milwaukee Plain
No. 4 Cincinnati Dial Type Plain
No. 08 Cincinnati Vertical
No. 3K K. & T. Milwaukee Vert.
No. 4H K. & T. Milwaukee Vert.
118 Van Norman Hyd. Mfg. (1942)
Model A Briggs Mfg.
54"x30"x16' Ingersoll Slab
10"x60" Pratt & Whitney Thread
12"x102" HT Lees-Bradner Thread
No. 118 Van Norman Hyd. Mfg. Mill

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60"x48"x27' American, 4 heads

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8 Spdl.—6" Goss & DeLeeuw Chucker
No. 56 Sundstrand Double End Cent. Mach.
15" Dill Slotter
18" Dill Slotter
Model 200 Micromatic Hor. Hone
Model H-7 Micromatic Vert. Hone
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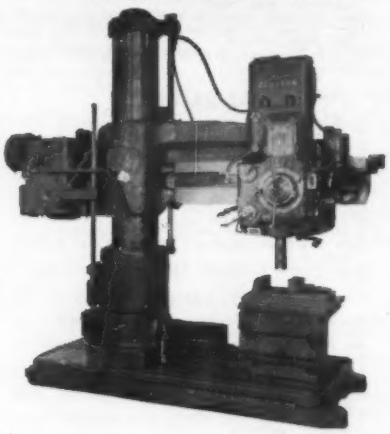
No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

No. 1-8 KENTS OWENS Hydraulic Horiz. Mill, Late Type, M.D.

6' arm x 17" column FOSDICK Economax Hydraulic Radial Drill, Motor on arm, late type. 1944

6' arm x 19" col. CARLTON Radial Drill, 20 HP., late type. 1943

DRILLING MACHINES



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No. 6 FEDERAL O.B.I. Press, 65 tons, cap., single geared, 4" stroke, M.D.

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T-56 VERSON Power Press Brake, 8' overall, late type, 100 tons cap., 1942.

No 20 WATERBURY FARREL Thread Roller, ⅜" cap. 1944, Motor Driven.

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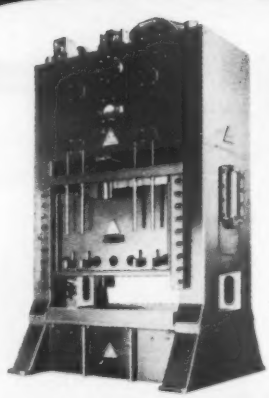

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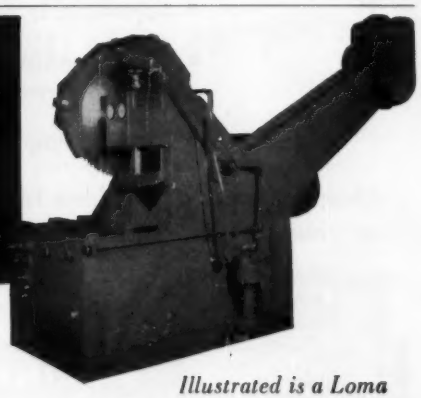

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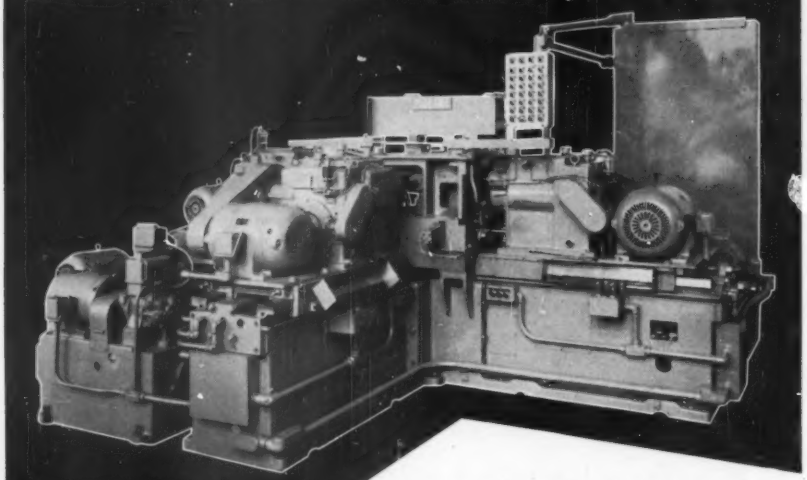

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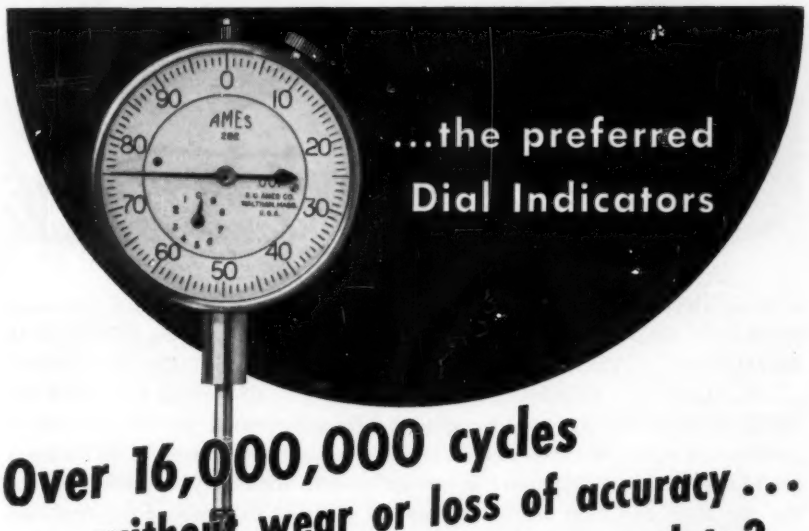

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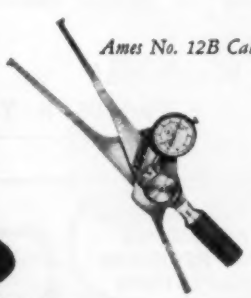

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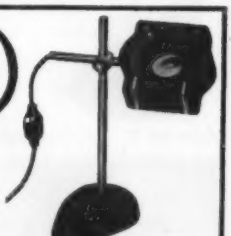

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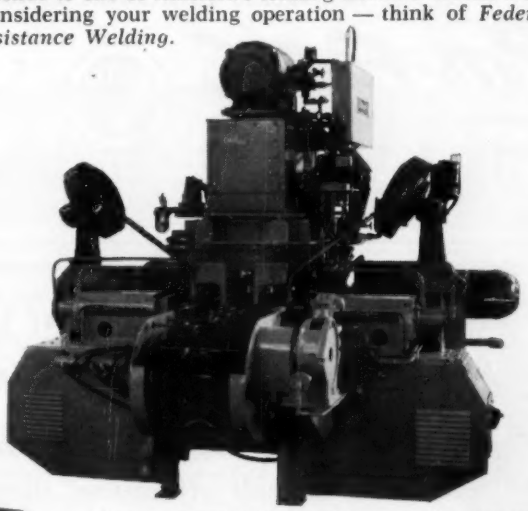

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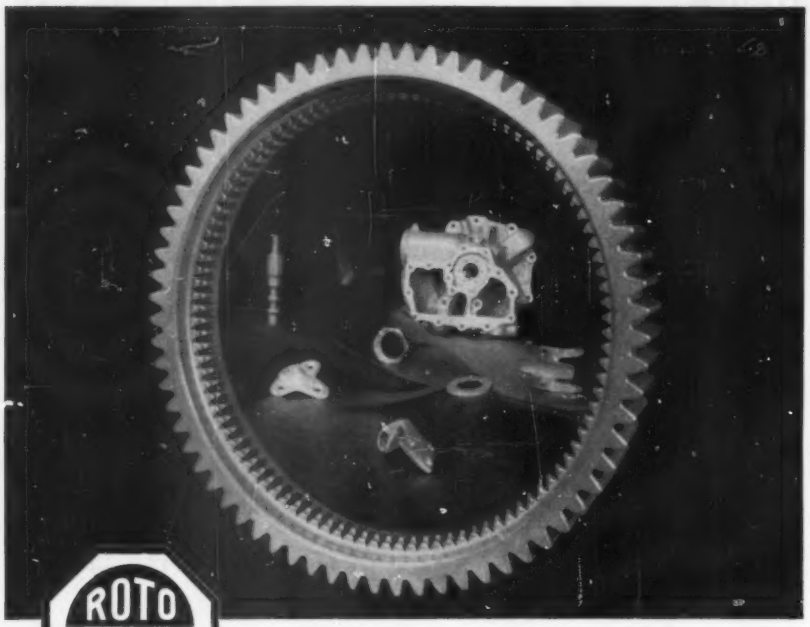

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DIES, TOOLS, JIGS and FIXTURES

UNITED accurately engineered dies are helping many manufacturers produce in quantity end products that meet specific requirements.

In many instances we have overcome deep drawing obstacles and have designed, developed and produced dies that not only meet exacting tolerances, but cut operating costs as well.

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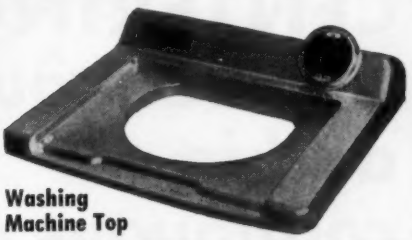
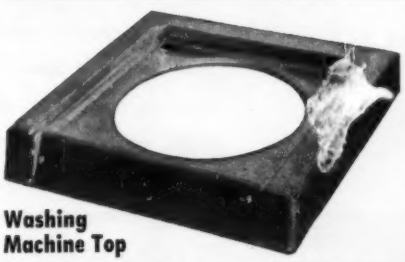


Washing Machine Top

Dryer Top



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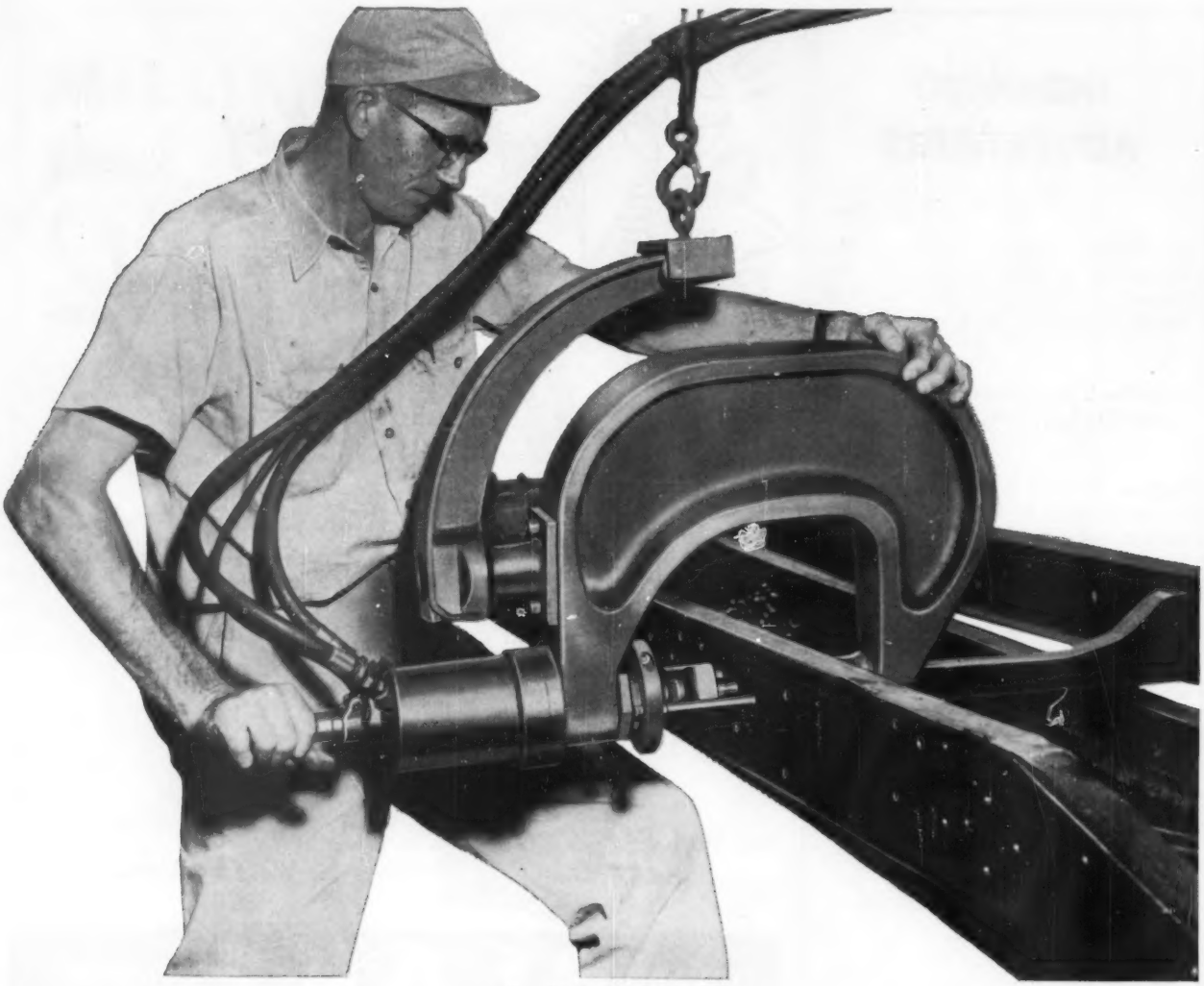

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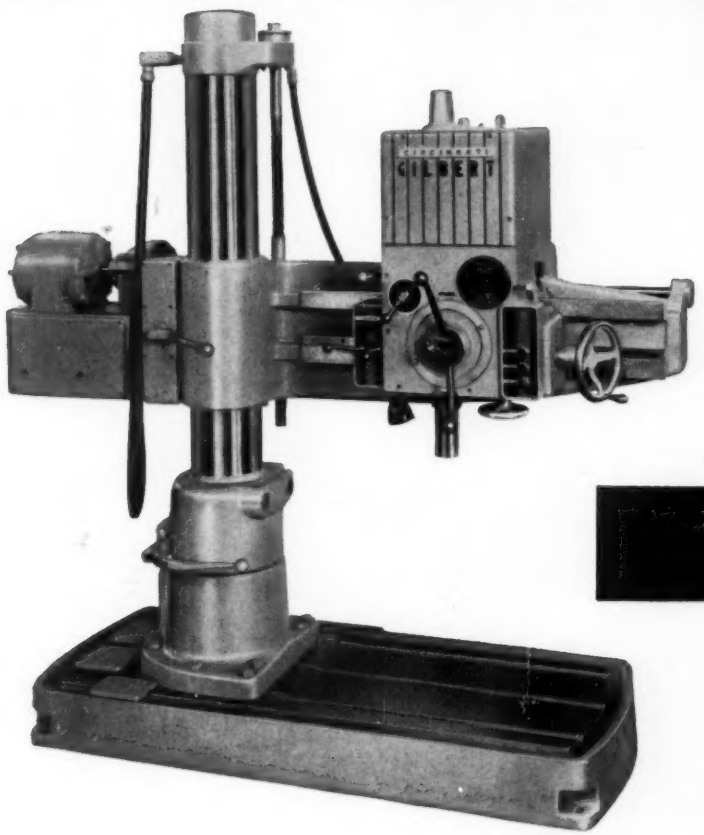

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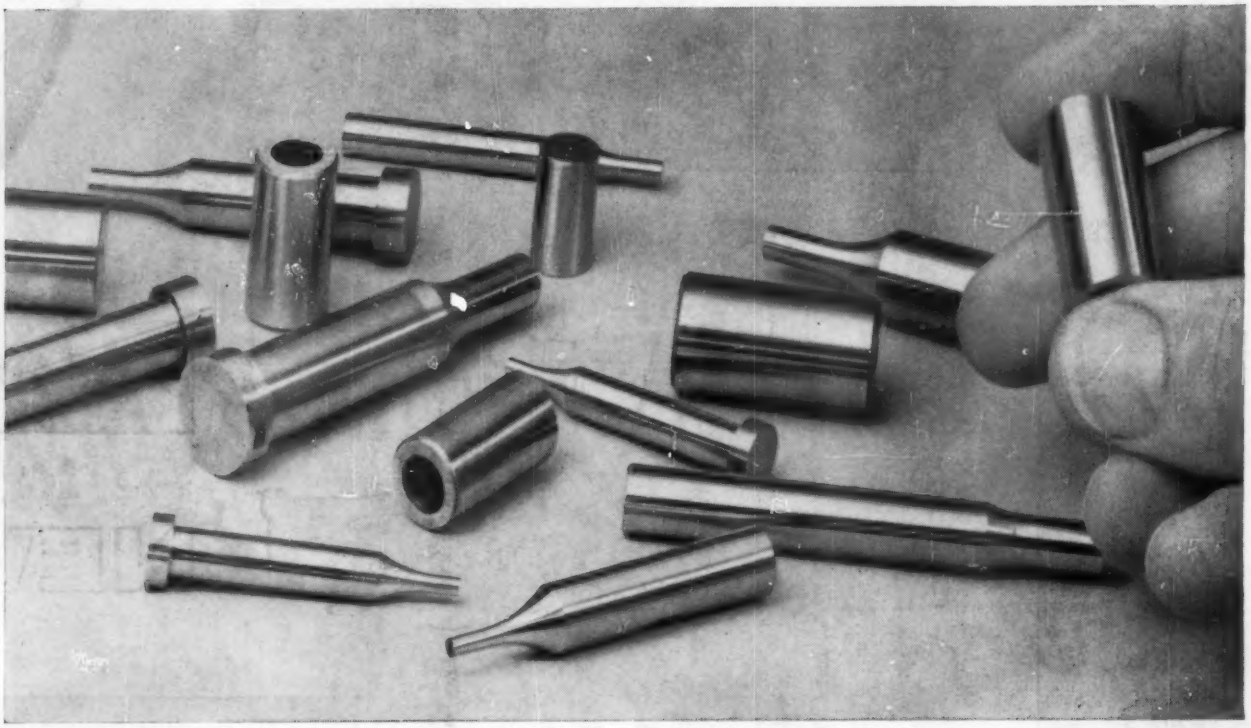

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